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Foreword

The UNITED STATES ARMED FORCES MEDICAL JOURNAL represents the unification of the BULLETIN OF THE UNITED STATES ARMY MEDICAL DEPARTMENT and the UNITED STATES NAVAL MEDICAL BULLETIN. This joint periodical is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense.

The Chairman of the Armed Forces Medical Policy Council and the Surgeons General of the several services invite all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, and officers of the Veterinary Corps of the Armed Forces, and the medical consultants of the Army, Navy, and Air Force to submit manuscripts for publication in this JOURNAL.

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OFFICE OF THE SECRETARY OF DEFENSE
ARMED FORCES MEDICAL POLICY COUNCIL
WASHINGTON 25, D.C.

MEMO: Personnel of the Medical Services of the United States Armed Forces

The first Military Medical Session of the Scientific Assembly of the American Medical Association will be held in Atlantic City on June 14 and 15. At this time, the first officers of the new Military Medical Session will be elected.

The efforts of the delegates from the three military services during the past several years in cooperation with the American Medical Association to establish such a Military Medical Session, to better inform their civilian confreres in the medical profession of military affairs, has been fulfilled. This new Military Medical Session will be the medium through which each medical officer may find professional enlightenment for the benefit of our nation, its defenses, and his own scientific advancement.

Thus, in the 104th year of the American Medical Association, by the establishment of this Session, full recognition will be given to the professional medical problems so vital to the defenses of our nation. The professional and scientific understanding of the military and civilian medical men of our country is now consummated on the forum floor of the scientific assembly of the American Medical Association.

I know that all physicians can and will want to support and participate in this new Military Medical Session.

Richard L. Meiling

Richard L. Meiling, M. D.
Chairman

UNITED STATES ARMED FORCES
MEDICAL JOURNAL

Volume II May 1951 Number 5

Symposium on Amyloidosis[1]

I. INTRODUCTION

David J. Cracovaner, *Captain, MC. U. S. N.*

AMYLOIDOSIS is a disease in which a foreign protein, amyloid, is produced and deposited in certain tissues. In the past year we have had seven cases of amyloidosis (all fatal) in this hospital. In none was the clinical diagnosis of amyloid disease established, though it was suspected in two of the cases. It is rather difficult to recognize amyloidosis as a clinical entity because there are no characteristic symptoms; there are, however, laboratory aids to the diagnosis of amyloidosis. The diagnosis of primary amyloidosis has been established on the basis of biopsies from sites including the skin, buccal mucosa, skeletal muscles, vagina, and stomach (2), and in all types of amyloidosis, the intravenous Congo red test may be helpful. When positive, it is almost pathognomonic of amyloid disease.

In the past the clinician has been prone to consider amyloidosis as essentially a pathologic diagnosis, one of those tissue changes to be demonstrated at autopsy or under the microscope, but about which little could be done even if recognized ante mortem. This attitude, if true, in all probability stemmed from the concept that amyloid disease was essentially irreversible. It is now well known, however, that recovery from secondary amyloidosis may occur, usually following the regression of the responsible inflammatory process (3) (4) (5). With the use of antibiotics such recovery may be observed more frequently. Too, the work

(1) Presented at the Monthly Staff Conference by the Pathology Department, U. S. Naval Hospital, St. Albans, Long Island, N. Y., 10 May 1949.

(2) Selikoff, I. J., and Robitzek, E. H.: Gingival biopsy for diagnosis of generalized amyloidosis. Am. J. Path. 23: 1099-1111, Nov. 1947.

(3) Rosenblatt, M. B.: Recovery from generalized amyloidosis secondary to pulmonary tuberculosis; report of case. Arch. Int. Med. 57: 562-565, Mar. 1936.

(4) Pearlman, A. W.: Regression of amyloidosis. Quart. Bull. Sea View Hosp. 6: 92-97, Oct. 1940.

(5) Dick, G. F., and Leiter, L.: Some factors in development, localization and reabsorption of experimental amyloidosis in rabbit. Am. J. Path. 17: 741-754, Sept. 1941.

of Grayzel et al. *(6)(7)* indicates that administration of liver substance, both experimentally in mice and clinically in humans, has a curative effect on secondary amyloidosis. Although there are probably some differences in the composition of amyloid in the primary and secondary forms of the disease, therapy with liver substance may be found to be of benefit in the primary type also.

(6) Grayzel, H. G.; Jacobi, M.; Warshall, H. B.; Bogin M.; and Bolker, H.: Amyloidosis; experimental studies. Arch. Path. *17*: 50-75, Jan. 1934.

(7) Jacobi, M., and Grayzel, H.: Generalized secondary amyloidosis; clinico-pathological study of 84 cases. J. Mt. Sinai Hosp. *12*: 339-363, May-June, 1945.

Symposium on Amyloidosis[1]

II. CLASSIFICATION AND PATHOLOGY OF AMYLOIDOSIS

Samuel H. Rosen, *M. D.* (8)

CLASSIFICATION

Amyloidosis presents no constant pathologic or clinical picture. This fact is reflected in such varied terminology as primary, idiopathic, atypical or paramyloidosis, secondary or typical amyloidosis, local or systemic amyloidosis, and tumor-forming amyloidosis. Amyloidosis has been seen in conjunction with, and presumably secondary to, a variety of diseases. Among these are: tuberculosis, osteomyelitis, pyelonephritis, lung abscess, bronchiectasis, carcinoma of the lung, carcinoma of the stomach, leukemia, Hodgkin's disease, multiple myeloma, tabes dorsalis, rheumatoid arthritis, thermal burns, cirrhosis of the liver, chronic empyema, malaria, leprosy, dysentery, chronic ulcerative colitis, regional enteritis, rheumatic fever, and diabetes. Thus far, no one has definitely demonstrated a common denominator for the pathogenesis of amyloidosis in this bewildering variety of diseases. Furthermore in patients with so-called primary amyloidosis no other recognizable disease process is present. The most generally accepted classification of amyloidosis is that of Reimann, Koucky, and Eklund (9). They postulated 4 groups: primary amyloidosis, secondary amyloidosis, amyloidosis with multiple myeloma, and tumor-forming amyloidosis.

Secondary amyloidosis is relatively common. It usually follows such long-standing diseases as tuberculosis or chronic suppuration. It involves solely or predominantly such parenchymatous organs as the liver, spleen, kidneys, and adrenals. Characteristically, the amyloid is deposited in a subendothelial position in the walls of capillaries and arterioles. Typical staining reactions are usually obtained with special stains.

Primary amyloidosis is relatively rare, only 63 cases having been reported up to 1948. It is characterized by the absence of a known etiologic factor or disease. It may be localized in the heart, skin, lungs, et cetera or may be systemic. Mesodermal tissues such as

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(8) Civilian Consultant in Pathology.

(9) Reimann, H. A.; Koucky, R. F.; and Eklund, C. M.: Primary amyloidosis limited to tissue of mesodermal origin. Am. J. Path. *11*: 977-988, Nov. 1935.

smooth and striated muscle and connective tissue of the cardiovascular system, gastrointestinal tract, lungs, skin, et cetera, are characteristically involved. The amyloid tends to be deposited in nodular form. It gives variable staining reactions (absent, pale, or rapidly fading) with the special stains.

Amyloidosis associated with and presumably secondary to multiple myeloma usually has a distribution and character similar to the primary form. It has been reported in 41 of 650 cases of multiple myeloma in the literature *(10)*.

Tumor-forming amyloidosis is usually similar in character to the primary form and is rare. It is frequently the type seen in multiple myeloma, and it is characterized by small or large, solitary or multiple amyloid tumors, especially in the larynx, but also in other sites such as tongue, pharynx, trachea, bronchi, nasal septum, eyes, bladder, bone, and subcutaneous tissues *(11)*.

This classification is far from satisfactory. There are cases in which the secondary type of amyloid distribution is encountered without an associated disease process and, conversely, there are cases in which the primary type of amyloid distribution is associated with known disease. Furthermore, there is much overlapping of the distribution and character of primary and secondary amyloidosis in individual cases. Also, while the association of tuberculosis and of chronic suppurative diseases with amyloidosis is of sufficiently high incidence to be considered causally significant, the association of some of the other diseases such as rheumatic fever and arthritis, with amyloidosis, is so rare as to suggest that the relationship may be only fortuitous *(10)*. Because the fundamental or direct cause of amyloidosis is not known and the associated diseases, such as tuberculosis and chronic suppuration are apparently only contributory and not necessary factors, it would seem that any attempt at an etiologic classification is bound to be unsatisfactory.

On the other hand, the known differences in anatomic distribution of amyloid seem striking enough to offer a basis for at least a provisional classification until the cause is discovered. Such a classification was suggested in a recent article *(10)* using the terms typical and atypical amyloidosis, introduced by Lubarsch *(12)* as the basis. In this classification *typical amyloidosis* includes all cases in which the deposition of amyloid occurs in some or all of the usual sites (liver, spleen, kidneys, and adrenals) with little or no amyloid in other organs, and

(10) King, L. S.: Atypical amyloid disease, with observations on new silver stain for amyloid. Am. J. Path. *24*: 1095-1115, Sept. 1948.

(11) Kramer, R., and Som, M. L.: Local tumor-like deposits of amyloid in larynx; report of case with review of literature. Arch. Otolaryng. *21*: 324-334, Mar. 1935.

(12) Lubarsch, O.: Zur Kenntnis ungewöhnlicher Amyloidablagerungen. Virchows Arch. f. path. Anat. *271*: 867-889, 1929.

atypical amyloidosis includes all cases in which the usual sites are spared entirely, or for the most part, although amyloid is deposited extensively in one or many less usual sites. In both groups there may be patients with or without other disease, that is, those whose condition has been called secondary and primary amyloidosis, respectively. Thus, such diagnostic designations as typical or atypical amyloidosis with tuberculosis; typical or atypical amyloidosis with multiple myeloma (rare); atypical local amyloidosis of the heart, lungs, or skin; atypical systemic amyloidosis; atypical amyloidosis with senility *(10);* and atypical local amyloidosis of the islets of Langerhans in diabetes might be used.

PATHOLOGY

In textbooks of pathology, amyloidosis is classed as a degenerative process along with fatty degeneration, hyaline degeneration, et cetera, but, just as fatty degeneration is believed to be, in some instances at least, an infiltration rather than a true degeneration, so it is generally believed that amyloidosis is an infiltration rather than a true degenerative process. As to the origin of amyloid or its mode of deposition, we have even less definite knowledge than we have about its chemical nature. The old view that amyloid is a compound of protein and chondroitin-sulfuric acid has been generally abandoned. Present evidence indicates that it is principally protein in character, that it has a sulfate-bearing polysaccharide fraction, and that it is a product of variable chemical composition comprising a group of closely related substances *(13) (14).* Of the many theories regarding the pathogenesis of amyloidosis the view that it involves, fundamentally, an immune mechanism, which may not be apparent and is possibly of an allergic nature, and that it entails a disturbance of the serum protein and a reaction between some component of the serum globulin and certain fixed tissue elements seem to have much in its favor from both a clinical and experimental standpoint *(14) (15) (16).*

A fundamental feature of amyloid degeneration is that the substance is seen not within cells, but in the intercellular tissues. It then damages the parenchyma in two essential ways. When sufficient amyloid has accumulated it compresses adjacent parenchymal cells and causes pressure atrophy and necrosis. This is best seen in the liver and adrenals. Or, if amyloid accumulates in the walls of blood vessels in

(13) Hass, G. M.: Studies of amyloid; isolation of polysaccharide from amyloid-bearing tissues. Arch. Path. 34: 92-105, July 1942.

(14) Hass, G. M.; Huntington, R.; and Krumdieck, N.: Amyloid; properties of amyloid deposits occurring in several species under diverse conditions. Arch. Path. 35: 226-241, Feb. 1943.

(15) Eklund, C. M., and Reimann, H. A.: Etiology of amyloid disease, with note on experimental renal amyloidosis. Arch. Path. *21:* 1-9, Jan. 1936.

(16) Koletsky, S., and Stecher, R. M.: Primary systemic amyloidosis; involvement of cardiac valves, joints and bones, with pathologic fracture of femur. Arch. Path. 27: 267-288, Feb. 1939.

an amount sufficient to narrow the lumens, the resulting decrease in nutrition causes fatty and hyaline droplet degeneration of the parenchyma as well as atrophy or necrosis. This process is best exemplified in the kidneys, where it has led to the designation *amyloid nephrosis.*

Grossly, organs involved in amyloidosis may show little or no increase in size or alteration of architecture when the amyloid deposit is slight; or they may show marked increase in size and alteration of appearance when the amount of amyloid is large. In the latter case the organs assume a peculiar waxy firmness and more or less pallor, the pallor being caused in part by a decrease in blood supply and in part by amyloid replacement of the parenchyma. The cut surface presents a spotty or more diffuse smooth translucency, depending on the degree of amyloid involvement and the organ involved. By applying Lugol's solution directly to the fresh tissues, the gross diagnosis can frequently be confirmed (fig. 1). The translucent amyloid foci take the iodine stain and appear mahogany brown. If, now, dilute sulfuric acid is applied, the color may deepen to a blue-black. It was the latter reaction that led Virchow to believe that the substance was a starchlike carbohydrate and so to give it the name amyloid, meaning starchlike.

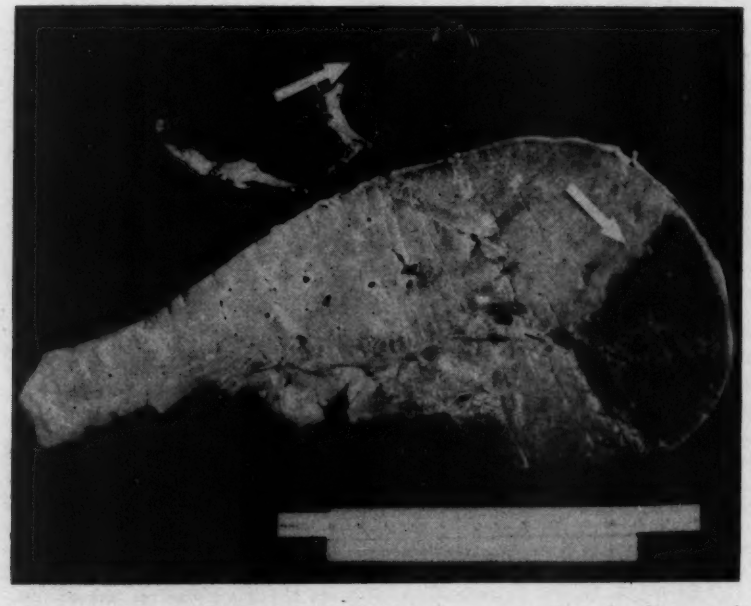

Figure 1.—Longitudinal section of liver and cross section of spleen, each treated at one end with Lugol's solution and dilute sulfuric acid, illustrating positive tests for amyloid. In the spleen the dark spots indicate malpighian corpuscles replaced by amyloid (sago spleen). In the liver the dark tracery indicates amyloid deposited around sinusoids.

Microscopically, amyloid is a more or less homogeneous hyalinelike substance. With the hematoxylin and eosin (H and E) stain it is indistinguishable from hyaline, although it tends to be a paler red. Generally, the distribution of the substance permits a diagnosis to be made even with the H and E stain. Special stains, however, are available for confirmation, which is necessary when only small amounts of amyloid are present or when the amyloid is deposited in unusual sites. These special stains are, principally, methyl violet and Congo red. Methyl violet stains amyloid violet. Congo red stains it salmon pink.

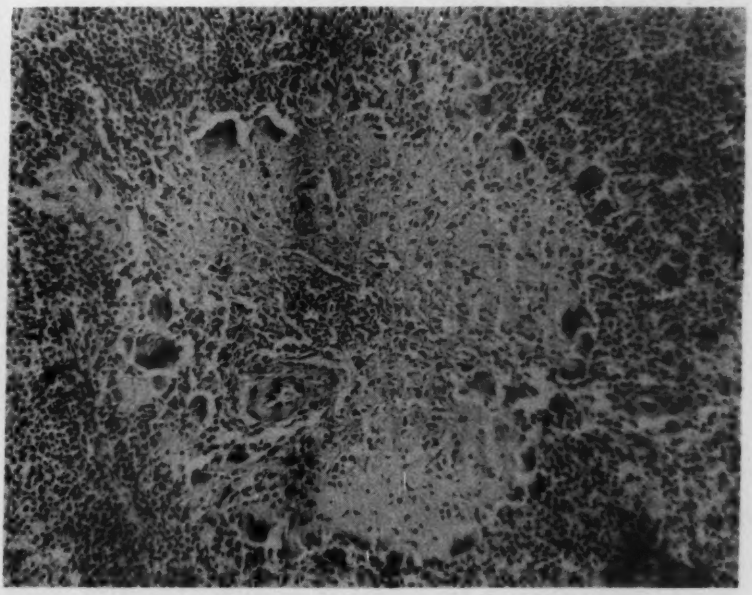

Figure 2.—Sago spleen stained with H and E showing replacement of a malpighian corpuscle and central arteriole by amyloid which is being engulfed by numerous foreign-body giant cells at the periphery.

The affinity of amyloid for Congo red is the basis of the intravenous use of the dye as a diagnostic procedure in suspected amyloid disease. In patients dying shortly after the performance of the Congo red test, the amyloid-containing viscera, particularly the liver, may show the typical salmon-pink stain strikingly. Although amyloid is not ordinarily seen within cells, it may act as a foreign body and be phagocytosed by foreign-body giant cells (fig. 2).

The physiologic disturbances caused by amyloidosis and the clinical findings are quite variable. They depend on the amount of amyloid deposited and the organ or organs involved, with complications arising from the associated disease process, such as tuberculosis, osteomyelitis, multiple myeloma, et cetera. With lesser degrees of amyloid dep-

osition there may be no detectable disturbances, and it is surprising how little disturbance and how few symptoms may result from extensive involvement of an organ or even of a number of organs. Because amyloid has been seen in practically every organ and tissue in the body, including the nervous system, it is not surprising that diseases of every system may be simulated, e.g., carcinoma of the tongue, scleroderma, myotonia, arthritis, neuritis, nephritis, coronary artery disease, valvular heart disease, purpura, carcinoma of the gastrointestinal tract, carcinoma of the lung, carcinoma of the larynx, carcinoma of the urinary tract, beriberi, et cetera *(16)*.

Symposium on Amyloidosis[1]

III. SECONDARY (TYPICAL) AMYLOIDOSIS IN QUADRIPLEGICS

REPORT OF FOUR CASES

Murdock S. Bowman, *Lieutenant, junior grade, MC, U. S. N.*
Ernest S. Redfield, *Lieutenant, MC, U. S. N.*

Patients with quadriplegia are seen from time to time in most hospitals, but institutions having more than one such patient under observation at one time or within a short period of time are limited, principally, to hospitals of the Armed Services or the Veterans' Administration. So far as could be determined from a fairly thorough search of the literature, complete reports, including autopsies, comparing the findings in a group of these patients have not been published *(17)*. This article presents briefly the clinical and autopsy findings in four consecutive cases of quadriplegia in young men who died at this hospital since August 1947, placing emphasis on the consistent finding of chronic suppurative renal disease and amyloidosis which, it is believed, were directly related to each other.

CASE REPORTS

Case 1.—A 28-year-old white man suffered a compression fracture of the body of the fifth cervical vertebra after a fall from a 125-foot cliff. No return of function occurred. The patient developed large decubitus ulcers which did not appear to involve the underlying bone. A periurethral abscess developed about 6 weeks after injury and soon after this a persistent upper urinary tract infection with calculi developed. Urine cultures showed *Proteus vulgaris*, *Pseudomonas aeruginosa*, and *Escherichia coli* at various times. Uremia was present terminally. The liver was enlarged down to the pelvic brim about 3 weeks before death. Diarrhea also occurred terminally and the patient died 27 months after injury. The pertinent autopsy findings included fracture of the fifth cervical vertebra with compression of the spinal cord, terminal bronchopneumonia, peripheral edema, ascites, hydrothorax, decubitus ulcers, bilateral pyelonephritis, and amyloidosis of the liver, spleen, adrenals, kidneys, and pancreas.

(17) Since this paper was presented, the following article appeared in the literature: Thompson, C. E., and Rice, M. J., Jr.: Secondary amyloidosis in spinal cord injury. Ann. Int. Med. *31*: 1057-1065, Dec. 1949.

Case 2.—A 20-year-old white man suffered dislocation of the sixth and seventh cervical vertebras in an automobile accident. No return of function occurred. Enlarging decubitus ulcers developed soon after injury. Four months after injury the spleen was enlarged and nontender. Upper urinary tract infection was present and persisted with calculus formation. Cystotomy was performed. Urine cultures showed *P. vulgaris.* Proteinuria was first noted about 7 months after injury. Terminally the patient developed uremia and died about 11 months after injury. The pertinent autopsy findings included posterior dislocation of the sixth and seventh cervical vertebras, terminal bronchopneumonia (microscopic), ascites, peripheral edema, hydrothorax, acute and chronic cystitis, bilateral ureteritis and pyelonephritis with calculi, decubitus ulcers, and amyloidosis of the liver, spleen, and kidneys.

Case 3.—A 23-year-old white man fractured and posteriorly dislocated the fifth and sixth cervical vertebras when he dived into the surf. Only slight recovery of function of the upper extremities occurred. Right renal and urinary bladder calculi were first noted roentgenologically 7 months after injury. Upper urinary tract infection was present almost continuously thereafter and the urine cultures showed *E. coli* and *P. vulgaris.* Proteinuria began concomitantly. Suprapubic cystotomy was performed 16 months after injury but infection of the upper urinary tract persisted. Uremia and peripheral edema were noted about 1 month prior to death, which occurred about 18 months after injury. The pertinent autopsy findings included fracture-dislocation of the fifth and sixth cervical vertebras with compression of the spinal cord, peripheral edema, slight peritoneal effusion, decubitus ulcers, terminal bronchopneumonia (seen only in the microscopic sections), chronic active ulcers of the stomach and duodenum, chronic cystitis, bilateral ureteritis and pyelonephritis with calculi in the right kidney, and amyloidosis of the liver, spleen, adrenals, kidneys, arterioles of the pancreas, and mucosa of the stomach and small intestine.

Case 4.—An 18-year-old white man, had an acute back pain followed by the rapid onset of quadriplegia. A tentative diagnosis of spinal arterial thrombosis was made. Decubitus ulcers and upper urinary tract infection developed within 2 months of the onset of quadriplegia. Urine cultures showed *P. vulgaris* and *Ps. aeruginosa.* Proteinuria occurred concomitantly but subsided, and became persistent only after 15 months of illness. An episode of icterus diagnosed as infectious hepatitis which was thought to have resulted from transfusions of whole blood occurred after 5 months. Uremia was first noted after 11 months, and in spite of slight gradual return of sensory and motor function, the patient died after 18 months of illness. The pertinent autopsy findings included lesions in the brain and spinal cord suggesting encephalitis lethargica and atypical poliomyelitis, terminal bronchopneumonia, a large decubitus ulcer of the sacrum, chronic cystitis, bilateral ureteritis and pyonephrosis with calculi, perforation of the lower pole of the right kidney with perinephric abscess and

acute generalized fibrinopurulent peritonitis, and amyloidosis of the liver, spleen, adrenals, kidneys, and small and large intestines.

DISCUSSION

The autopsy findings in the four cases are compared in table 1. Grossly, the amyloid took a mahogany brown stain with Lugol's solution in all locations and in microscopic preparations it stained typically in

TABLE 1.—*Comparison of autopsy findings in 4 cases of secondary amyloidosis*

	Case 1	Case 2	Case 3	Case 4
Age at time of injury (years)	28	20	23	18
Duration of illness (months)	27	11	18	18
Peripheral edema	Slight	Marked	Marked	None.
Ascites	Moderate	Moderate	Slight	Slight (associated fibrinopurulent peritonitis).
Hydrothorax	Moderate	Marked	Negligible	None.
Decubitus ulcers	Large	Large	Large	Large (possible involvement of sacral bone).
Pyelonephritis	Marked	Marked	Marked	Marked.
Organs containing amyloid				
Liver	Marked	Slight	Slight	Moderate.
Spleen	Marked	Moderate	Marked	Moderate.
Adrenals	Moderate	Not examined	Slight	Slight.
Kidneys	Moderate	Slight	Slight	Slight.
Other	Slight (pancreas)	None	Slight (gastrointestinal tract and pancreas)	Slight (intestinal tract).

all sites with Congo red and methyl violet. The liver was enlarged in all four cases, usually about one and one-half times normal weight, except in case 2, in which only slight enlargement was present. Grossly, amyloid in the liver was only suspected from a vague waxiness. Lugol's solution gave a mahogany brown tracery, most marked in

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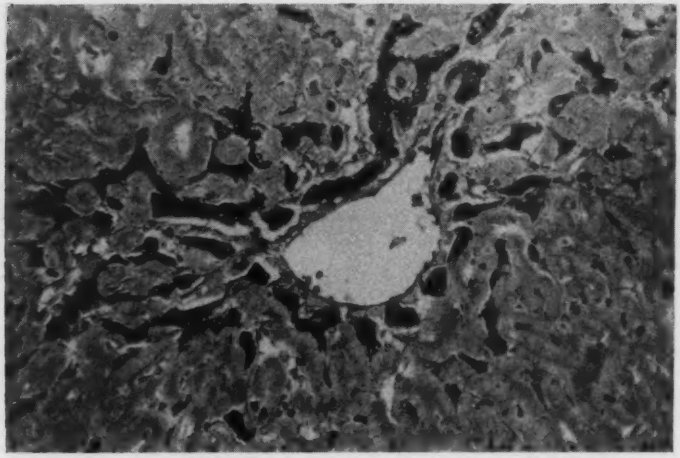

Figure 3.—Case 1. Section of the liver stained with methyl violet showing marked pressure atrophy of liver cords (darker staining) by amyloid (paler staining) deposited around sinusoids.

cases 1 and 4 (fig. 1) and only suggestive or 1 plus in cases 2 and 3. Microscopically (fig. 3) amyloid was found along the walls of the sinusoids and in arterioles in amounts correlating closely with the gross appearance obtained with Lugol's solution. Cords of liver cells showed more or less compression by amyloid with atrophic and degenerative change. The spleen was consistently enlarged from two to three times normal weight. Amyloid was deposited in moderate amounts, in the

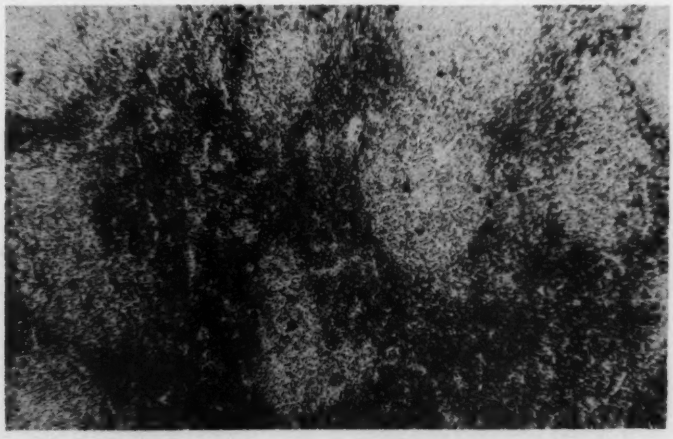

Figure 4.—Case 2. Section of sago spleen stained with methyl violet showing replacement of malpighian corpuscles (pale staining) by amyloid. The dark spots are artefacts.

corpuscles for the most part, and also in sinuses and arterioles (fig. 4). Grossly, its presence was suspected from slightly raised translucent spots scattered in the pulp in typical sago distribution and confirmed by Lugol's test (fig. 1).

The kidneys in all four cases were about one and one-half times normal weight except the left kidney in case 3 which was three times the usual weight and hyperplastic to compensate for a congenitally hypoplastic right kidney. The gross appearance was that of advanced chronic and acute pyelonephritis with formed calculi. The waxy appearance of gross amyloid deposits was somewhat obscured by the inflammation present, but Lugol's solution brought out definite mahogany brown spots in the cortex corresponding to glomerular tufts which on microscopic examination were found to contain amyloid. Amyloid deposits were also seen in the arterioles in all cases, in the stroma about the tubules in cases 1 and 3, and casts resembling amyloid were seen in some of the tubules in case 3. The adrenals in the three cases

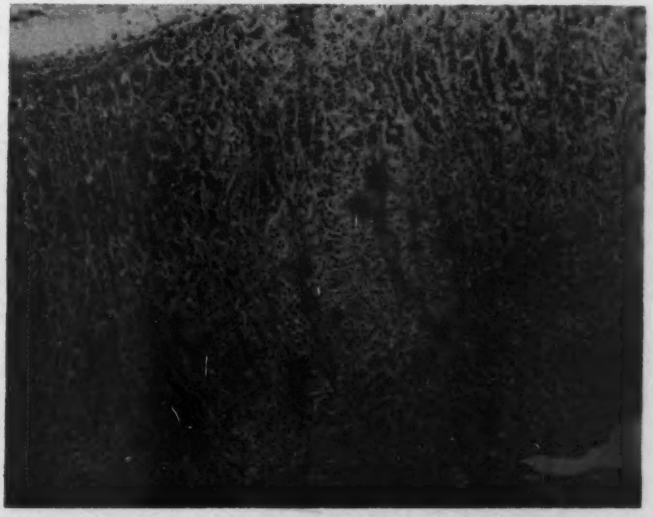

Figure 5.—Case 4. Section of the adrenal cortex stained with H and E showing amyloid deposited around capillaries predominantly in the fascicular zone with pressure atrophy and degeneration of cortical cells.

in which they were examined were essentially normal in size. Lugol's solution showed amyloid to be present in moderate amounts in the cortex, usually the inner layers. Microscopic confirmation of this distribution was obtained by finding amyloid in arterioles and between cords of cells in the reticular and fascicular layers causing pressure atrophy and degeneration of many cortical cells (fig. 5).

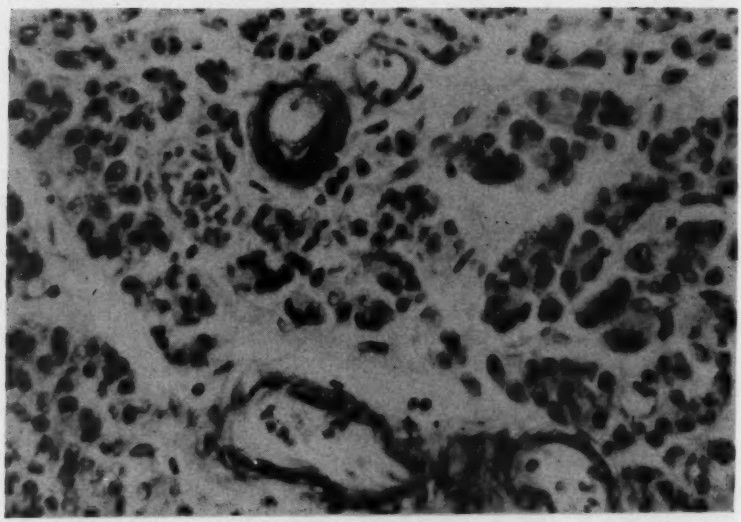

Figure 6.—Case 3. Section of the pancreas stained with Congo red showing amyloid in the arterioles.

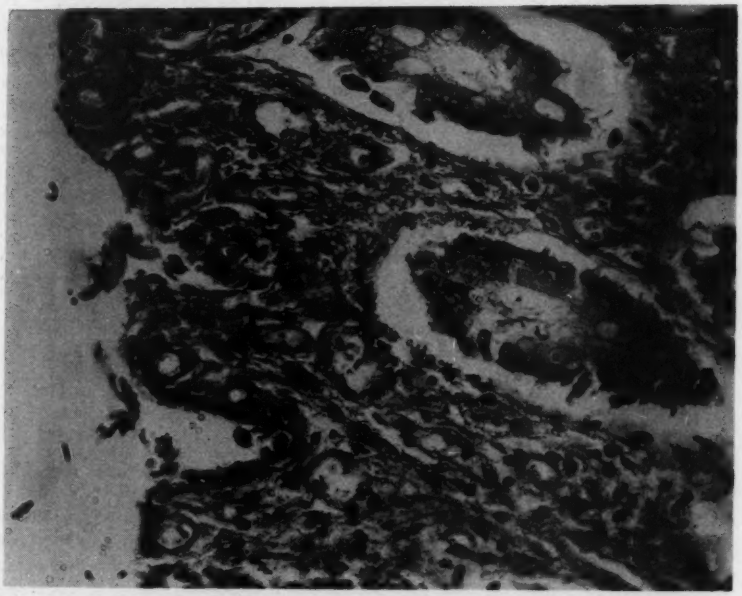

Figure 7.—Case 4. Section of the colonic mucosa stained with Congo red showing amyloid around capillaries at surface (broad dark lines and circles).

Amyloid deposition in case 1 was seen in arterioles in the pancreas as well as in an occasional islet and duct wall. In case 3 it was also seen in arterioles of the pancreas (fig. 6) as well as in the mucosa of the stomach and small intestine. It was also seen in the mucosa of the small intestine and colon in case 4 (fig. 7). The skin was not examined in cases 2, 3, and 4, but no amyloid was seen here in case 1.

COMMENT

These cases have been presented principally as examples of secondary amyloidosis as well as to point out the possible high incidence of this condition in quadriplegic patients. The disease which presumably caused the amyloidosis was, in all cases, a chronic suppurative process, pyelonephritis, with decubitus ulcers possibly contributing an added factor. Although pyelonephritis is not one of the more common diseases associated with amyloidosis this association has been noted frequently in the literature. Most cases of pyelonephritis are not of sufficiently long duration to cause amyloidosis. The patient is either cured by medical means if the disease is not too severe, or if it is severe and unilateral, by operation. In quadriplegics, however, conditions are favorable for the occurrence of intractable chronic urinary tract infection, as well as decubitus ulcers, because with modern methods of therapy these patients may be kept alive for relatively long periods. This prolonged combination of infection and debility may account for the high incidence of amyloidosis in quadriplegics.

The amyloid involvement of the liver, spleen, kidneys, and adrenals in all four cases is the usual finding in secondary, or typical, amyloidosis. The fact that in three of these cases the pancreas and/or the gastrointestinal tract were also slightly involved illustrates the tendency for overlapping of the primary (atypical) and secondary (typical) types of distribution. The staining reactions of the amyloid with iodine, methyl violet, and Congo red were, in all instances, also typical of those seen with secondary amyloidosis. The ulcers of the stomach and duodenum in case 3 may have been secondary to the amyloid involvement of the mucosa, although the possibility of their being ordinary peptic ulcers cannot be excluded. Gastrointestinal ulcers casued by amyloid have been reported *(12)*.

It is believed that the episode of jaundice in case 4 was a manifestation of infectious hepatitis, which was probably caused by whole blood transfusions. Jaundice is rarely caused by amyloidosis of the liver even when the liver involvement is marked *(18)*. The clinical findings, including the uremia and death of all of the patients, is largely attributable to the chronic urinary tract infection. The amyloidosis was, on the whole, of only a slight to moderate degree and probably only served as a contributory factor, as is commonly the case. From a

(18) Orloff, J., and Felder, L.: Primary systemic amyloidosis; jaundice as rare accompaniment. Am. J. M. Sc. *212*: 275-279, Sept. 1946.

therapeutic standpoint, liver therapy directed toward reversal or prevention of the amyloidosis might prolong the life of these patients by protecting those organs concerned with natural resistance to infection, that is, the spleen, liver, and adrenal glands (7).

Symposium on Amyloidosis[1]

IV. PRIMARY (ATYPICAL) LOCALIZED AMYLOIDOSIS OF HEART

CASE REPORT

James M. Smith, *Lieutenant Commander, MC, U. S. N.*

Case 5.—A 36-year-old white man was admitted to this hospital with a diagnosis of lobar pneumonia. He had been well until 10 days prior to admission, when he developed, progressively, symptoms and signs compatible with the admission diagnosis. Physical examination, laboratory tests, and roentgenograms of the chest confirmed the diagnosis. Questionable heart disease was mentioned in the past history. The exact details were not recorded. There were roentgenographic evidences of cardiac hypertrophy and electrocardiographic changes and clinical signs of congestive heart failure. The patient was treated with penicillin for the pneumonia and with digitalis derivatives for the heart failure. The response to therapy was gradual, but definite, and by the nineteenth hospital day clinical improvement was sufficient to permit toilet privileges. On the thirty-third hospital day, the patient again suddenly developed congestive heart failure. Digitalis therapy again produced symptomatic improvement, but on the forty-third hospital day signs and symptoms of congestive heart failure returned and the patient died suddenly on the forty-eighth hospital day. Clinical impressions at the time of death included rheumatic or virus pneumonia, rheumatic or virus myocarditis, old pulmonary infarcts, and terminal pulmonary embolism.

The autopsy findings were not striking. Chronic passive congestion of the viscera, pulmonary edema, bilateral slight pleural effusion (about 200 cc. on each side), slight pericardial effusion (about 200 cc.), and slight ascites (about 250 cc.) were observed. The heart was almost twice the normal size and weighed 550 grams. The hypertrophy was moderate but the dilatation of all chambers was marked. The myocardium was pale in color and rubbery in consistency; it did not, however, have the firm waxy consistency typical of advanced amyloidosis of the heart. On sectioning, white to yellow foci from 1 to 2 mm. in diameter were encountered. The coronary vessels and valve leaflets were normal. The gross test for amyloid with Lugol's solution was negative. Histologically, with the H and E stain, amorphous pink-staining material was seen in small irregular areas replacing muscle fibers, as well as focally

between muscle fibers, causing compression of the fibers, and occasionally surrounding the vessels. (Figure 8 shows a section stained with methyl violet.) Although this material did not give the typical tinctorial reaction for amyloid with methyl violet and Congo red stains, this is considered an instance of primary amyloidosis of the heart in view of the well-known variability and even lack of special staining of primary amyloidosis and because the physical appearance and distribution of the material were compatible with those of amyloid. The total myocardial involvement appeared to be only moderate. Nothing resembling amyloid was seen in any of the other organs or tissues studied.

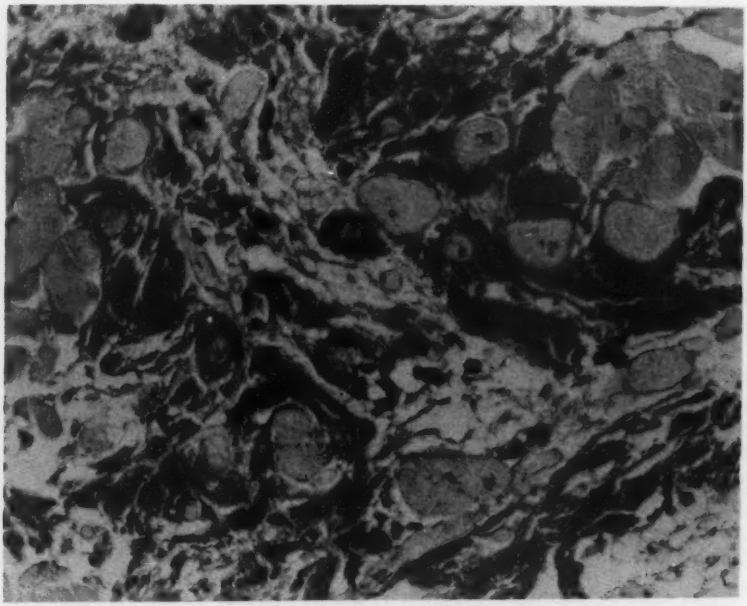

Figure 8.—Case 5. Section of the myocardium stained with methyl violet showing amyloid (dark staining) between and replacing muscle fibers.

COMMENT

Amyloid disease of the heart is classified as: (1) primary (atypical) localized amyloidosis of the heart, in which amyloid deposition is confined to the heart with little or no involvement of other organs; (2) primary systemic amyloidosis, in which amyloid deposition in the heart is part of a generalized involvement of striated and smooth muscle and connective tissue; and (3) secondary (typical) amyloidosis, in which the characteristic involvement of the liver, spleen, kidneys, and adrenals is occasionally associated with amyloid deposition in the

heart *(19)*. The present case falls in the first class. The greatest number of cases, however, falls in the second class.

Wessler and Freedberg *(20)*, in a review of the literature and of the case records of 4 Bostonian hospitals, recorded a total of 64 cases of cardiac amyloidosis of unknown origin. In a series of 22 unselected cases of primary amyloidosis of the heart the average age at death was 57 years (range 36 to 80). The sex distribution was equal. King *(10)* recently reported 5 patients (3 male and 2 female) with primary amyloidosis of the heart and congestive heart failure associated with senility. The ages in this series varied from 83 to 93 years, and the cardiac amyloidosis was an incidental postmortem finding. Contrary to a former belief, primary amyloidosis occurs in Negroes but less frequently than in white persons *(21)*. The relative incidence of primary amyloidosis is indicated by the report of Dillon and Evans *(22)* that out of 4,551 autopsies at the Peter Bent Brigham Hospital from 1913 to 1941 there were 23 cases of proved amyloid disease of which only 3 were primary.

The average duration of life in primary systemic amyloidosis is about 2½ years, although one case of 14 years' duration is on record *(16)*. Congestive heart failure caused by myocardial involvement was considered the cause of death in about 50 percent of these cases. Although recovery from secondary amyloidosis has been reported *(3)* *(4)* *(7)*. Dillon and Evans *(22)* were unable to find any mention of recovery from primary amyloidosis in the literature.

The correct clinical diagnosis of primary systemic amyloidosis is seldom made. According to Ballinger *(23)* the diagnosis was made in only 8 of 46 cases examined postmortem and reported in the literature. The clinical diagnosis in the case presented here was complicated by the fact that the history and presenting signs and symptoms were typical of pneumonia. We may surmise that this patient with primary amyloidosis of the heart had a narrow margin of cardiac reserve, and that with the intercurrent pneumonia this margin was lost. The penicillin cured the pneumonia but the recurring congestive heart failure did not completely respond to digitalization.

The most constant clinical feature observed in amyloidosis of the heart is intractable congestive heart failure, which was the outstanding feature of the present case. This is directly related to the amyloid

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(19) Budd, J. W.: Primary amyloid disease of heart; report of case. Am. J. Path. *10*: 299-308, Mar. 1934.

(20) Wessler, S., and Freedberg, A. S.: Cardiac amyloidosis; electrocardiographic and pathologic observations. Arch. Int. Med. *82*: 63-74, July 1948.

(21) Pearson, B.; Rice, M. M.; and Dickens, K. L.: Primary systemic amyloidosis; report of 2 cases in Negroes, with special reference to certain histologic criteria for diagnosis. Arch. Path. *32*: 1-10, July 1941.

(22) Dillon, J. A., and Evans, L. R.: Primary amyloidosis; report of 3 cases. Ann. Int. Med. *17*: 722-731, Oct. 1942.

(23) Ballinger, J.: Amyloid heart disease. Am. J. M. Sc. *217*: 308-313, Mar. 1949.

present in the heart. In some instances in addition to the myocardial deposits, which cause atrophy and replacement of muscle fibers, coronary vessel walls and valve leaflets are infiltrated with amyloid to such a degree that coronary insufficiency and rheumatic valvulitis are simulated and erroneously diagnosed *(16)* *(22)*.

The electrocardiographic findings in primary amyloidosis of the heart vary and are not diagnostic; they may be indistinguishable from those seen in cases of myocardial infarction. They usually include one or more of the following: prolonged P-R and QRS intervals, low voltage, deep Q waves, and variations in T waves *(20)*. In the case presented, repeated electrocardiograms listed P-R intervals at the upper limits of normal, low voltage, and altered T waves. The heart is usually slightly to moderately enlarged, as in the present case, but it may show no enlargement or fairly marked enlargement. A fairly frequent, although perhaps over-rated *(24)* clinical finding of diagnostic value in the systemic type of primary amyloidosis is an associated macroglossia. As the diagnosis of primary amyloidosis was not considered at autopsy, it is not known definitely in this case whether there were any amyloid deposits in the tongue. No appreciable enlargement of the tongue was noted clinically or at autopsy.

In conclusion it may be emphasized that primary amyloidosis of the heart should be considered in all cases presenting the features of intractable congestive heart failure, moderate cardiac hypertrophy, definite but nonspecific electrocardiographic changes, and the absence of a history of hypertension, arteriosclerosis, or valvular heart disease. Although it is an uncommon disease, the late Soma Weiss *(25)* considered primary amyloidosis of the heart important enough to be considered in the differential diagnosis in all cases of clinically bizarre heart disease.

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(24) Dahlin, D. C.: Primary amyloidosis, with report of six cases. Am. J. Path. 25: 105-123, Jan. 1949.

(25) Weiss, S. (Boston): Diseases of heart and aorta which are not well recognized. M. Clin. North America 23: 1323-1344, Sept. 1939.

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V. ATYPICAL AMYLOIDOSIS IN MULTIPLE MYELOMA

CASE REPORT

Francis J. McMahon, *Lieutenant Commander, MC, U. S. N.*

The occurrence of atypical and occasionally typical amyloidosis in multiple myeloma is well recognized. Magnus-Levy *(26)* reported the presence of amyloid, chiefly in muscles and joints, in 35 of 150 cases of multiple myeloma examined postmortem an incidence of 24 percent. Atkinson *(27)* collected 643 recorded cases of multiple myeloma in 1937 and found amyloid reported in 40, an incidence of 7 percent. The distribution in these 40 cases was both typical and atypical, involving practically every organ and system of the body including the myeloma foci. Tarr and Ferris *(28)* reported 1 case and collected 11 others from the literature in which the predominant amyloid deposits were in the form of tumor nodules located in the muscles and about the joints and being absent for the most part from the typical sites, or if present there, showing atypical staining reactions. The present article deals with a case of multiple myeloma associated with atypical amyloidosis, the amyloid being confined to the tumor foci and the kidneys.

CASE REPORT

Case 6.—A 52-year-old white man complained of low back pain of 5 months' duration, which gradually increased in severity, radiating down both legs to the knees and being aggravated by lying down. Following a spinal puncture he became paraplegic. A laminectomy was performed revealing a tumor mass surrounding and compressing the cord at the level of the eleventh thoracic vertebra and apparently arising in the vertebral body. The biopsy led to a diagnosis of plasma cell myeloma; myeloma cells were also noted in a smear from the sternal marrow. Roentgenograms of the bony skeleton revealed round osteolytic lesions in the skull, pelvis, ribs, vertebras, and femurs, that in time increased

(26) Magnus-Levy, A.: Multiple Myelome; Euglobulinämie. Zur Klinik und Pathologie. Amyloidosis. Ztschr. f. klin. Med. *126*: 62-111, 1933.

(27) Atkinson, F. R. B.: Multiple myelomata. M. Press *195*: 312, Oct. 6, 1937; 327, Oct. 13, 1937.

(28) Tarr, L., and Ferris, H. W.: Multiple myeloma associated with nodular deposits of amyloid in muscles and joints and with Bence Jones proteinuria. Arch. Int. Med. 64: 820-833, Oct. 1939.

in size and number. Twelve months following the onset of this illness, hypertension with symptoms developed, the systolic pressures rising from 156 to 190 and the diastolic from 88 to 110. The patient was treated with stilbamidine which controlled the pain. Anemia developed and the patient died in uremia complicated by bronchopneumonia 13 months after the onset of his illness.

Bence-Jones proteinuria was observed once during the last 3 months of the illness, and a 4 plus persistent albuminuria was also observed within the same period. The nonprotein nitrogen, which was normal on admission, rose to 346 mg. per 100 cc. on the day of death. The Congo red test performed early in the disease was negative. There was no hypercalcemia but the blood phosphorus rose to 8.3 mg. per 100 cc. and alkaline phosphatase rose to 7.3 Bodansky units.

The principal autopsy findings were: multiple myeloma; myelomatous nephrosis; amyloidosis of myelomatous foci and of the kidneys; slight hypertrophy and dilatation of the heart; and confluent bronchopneumonia of the right lung.

The vertebras, sternum, ribs, and calvarium showed irregular foci of destruction from a few millimeters to 1 centimeter or more, filled with soft red-gray tumor tissue. The tumor had invaded the paravertebral soft tissues and encroached on and compressed the spinal cord. Lugol's solution brought out mahogany brown spots and streaks in the tumor. Microscopically, with the H and E stain, these areas were seen to be composed of a rather pale pink-staining homogeneous amyloid material

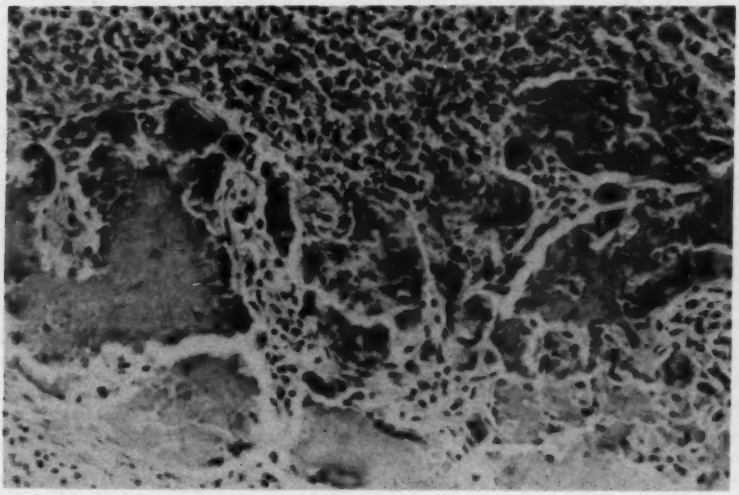

Figure 9.—Case 6. Section of a vertebra stained with Congo red showing irregular masses of amyloid within an area of plasma cell myeloma being engulfed by foreign-body giant cells.

occurring in masses and strands within the plasma cell myeloma. Figure 9 shows a section stained with Congo red. The tumor was a typical plasma cell myeloma crowding out normal hematopoietic marrow and destroying bony trabeculas. The kidneys weighed 210 and 225 grams, being slightly enlarged, pale, and yellow-brown. Many prominent opaque yellow streaks were noted in the cortico-medullary region; on application of Lugol's solution these appeared as mahogany brown streaks. Microscopically the kidneys presented the findings of myelomatous nephrosis with atypical amyloidosis. In the cortico-medullary region the H and E stain brought out irregular linear

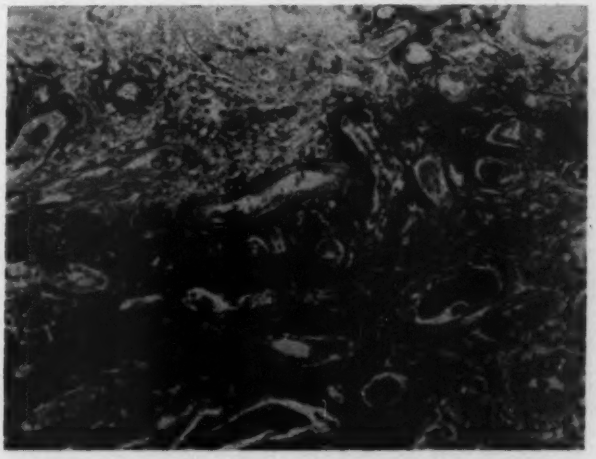

Figure 10.—Case 6. Section of the cortico-medullary region of the kidney stained with methyl violet showing linear deposits of amyloid between tubules, compression and degeneration of tubules, and dense casts in distended tubules.

deposits of pale pink-staining material in the stroma. These were interpreted as amyloid causing compression atrophy of some of the tubules. (Figure 10 shows a section stained with methyl violet.) Many other tubules were distended with dense, pink and blue staining casts and showed marked degenerative changes. Many of the casts were surrounded by multinucleated cell masses resembling foreign-body giant cells (fig. 11) as in the case reported by Tarr and Ferris (*28*). These casts were probably composed of Bence-Jones' or other abnormal protein but some of them may have been amyloid. The amyloid did not show the typical staining reaction with Congo red or methyl violet either in the kidneys or in the tumor. The glomeruli appeared normal except for dilatation of the capsular spaces apparently due to tubular obstruction by the numerous casts (fig. 11). There was a diffuse increase in connective tissue stroma with marked infiltration of small round cells.

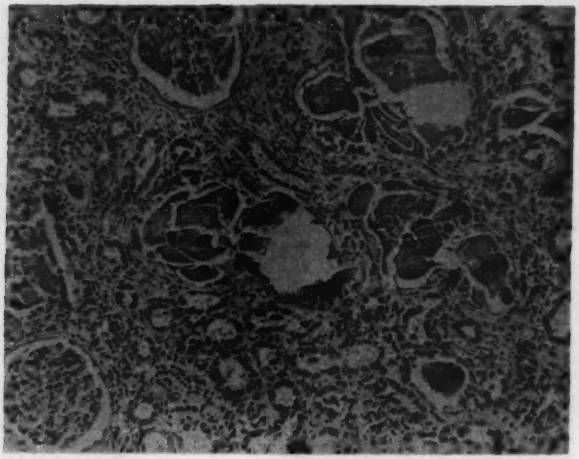

Figure 11.—Case 6. Section of the cortical region of the kidney showing myelomatous nephrosis. Note tubules distended with casts surrounded by multinucleated cell masses resembling foreign-body giant cells, distention of glomerular capsular spaces, and increase in connective tissue stroma with small round cell infiltration. Unlike the usual amyloid kidney (cf. fig. 14) the glomeruli here contain no amyloid, which is present only in the stroma (cf. fig. 10).

COMMENT

The case presented illustrates the occurrence of amyloidosis in multiple myeloma. The amyloidosis was of the localized atypical type occurring only in the tumor and kidneys. It was atypical not only in distribution but also in character in that it was deposited in masses and gave atypical staining reactions with Congo red and methyl violet. This is the type of amyloidosis that is most often seen with multiple myeloma *(27)*. In the kidney itself the distribution was also atypical because the glomeruli and arterioles were spared (fig. 11) and the amyloid was deposited solely in the connective tissue stroma between the tubules (fig. 10).

In both the tumor and the kidneys the amount of amyloid was so small and its distribution of such a nature that none of the patient's symptoms could be attributed to it. The renal insufficiency is explained on the basis of so-called myelomatous nephrosis rather than amyloid nephrosis. The hypertension may also be attributed to the myelomatous nephrosis. This, however, is an unusual feature as the blood pressure is almost always normal in myelomatous nephrosis. The same is also true of amyloid nephrosis *(29)* *(30)*. The small amount of amyloid found at

(29) Dixon, H. M.: Renal amyloidosis in relation to renal insufficiency. Am. J. M. Sc. 187: 401-411, Mar. 1934.

(30) Pearlman, A. W.: Amyloidosis; clinical and pathological study of 135 cases. Quart. Bull. Sea View Hosp. 6: 295-308 Apr. 1941.

autopsy is also consistent with the negative Congo red test obtained during life, since this test is usually negative unless there is marked amyloid deposition in the body *(31)*.

In the early part of the patient's illness, his pain was thought to be arthritic. This is of interest because, according to Tarr and Ferris *(28)*, amyloid deposits in multiple myeloma may produce arthritic symptoms and signs, especially of the rheumatoid type. In the present case, however, the pain was caused by the myelomatous involvement of the vertebras.

The relationship of hyperproteinemia, especially hyperglobulinemia and other abnormal protein fractions, to amyloidosis in multiple myeloma has received much attention *(32)*. Patients with multiple myeloma as well as certain other conditions associated with amyloidosis are known to have long periods of hyperglobulinemia. Magnus-Levy *(33)* and others *(28)* who observed that some of the tubular casts in myelomatous kidneys stained like amyloid suggested that increased serum proteins, whether Bence-Jones' protein, globulin, or other abnormal protein fraction, served as the precursor of amyloid.

The incidence of amyloidosis in multiple myeloma is fairly high. This should lead one to consider the possibility of amyloidosis in every patient with multiple myeloma and of multiple myeloma in every patient with atypical amyloidosis.

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(31) Stemmerman, M. G., and Auerbach, O.: Value and limitations of congo red test for amyloidosis. Am. J. M. Sc. *208*: 305-309, Sept. 1944.

(32) Gutman, A. B., and others; Fractionation of serum proteins in hyperproteinemia, with special reference to multiple myeloma. J. Clin. Investigation *20*: 765-783, Nov. 1941.

(33) Magnus-Levy, A.: Bence-Jones-Eiweiss und Amyloid. Ztschr. f. klin. Med. *116*: 510-531, 1931.

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VI. AMYLOIDOSIS OF MIXED PRIMARY (ATYPICAL) AND SECONDARY (TYPICAL) TYPES WITH RENAL INSUFFICIENCY IN A CASE OF CHRONIC PULMONARY TUBERCULOSIS

Ernest S. Redfield, *Lieutenant, MC, U. S. N.*

Amyloidosis is most frequently seen in association with chronic pulmonary tuberculosis, some writers stating the incidence to be as high as 40 percent *(30)*. The distribution of the amyloid is usually of the secondary (typical) type, that is, principally or solely in the liver, spleen, adrenal glands, and kidneys. The following case is of interest in that it illustrates the relatively uncommon combination of primary (atypical) and secondary types of amyloid distribution, and the occurrence of renal and possibly adrenal insufficiency caused by large deposits of amyloid in the kidneys and adrenal glands in a patient with chronic pulmonary tuberculosis.

CASE REPORT

Case 7.—A 59-year-old white man had a history of pulmonary tuberculosis of a little over 10 years' duration at the time of death. The course was slow but progressive. New lesions appeared first in one lung and then in the other with partial healing of some of the lesions during periods of bed rest. Thoracoplasty was performed for a cavity in the left lung about 2½ years after the lesions were first observed in the roentgenograms. The sputum became persistently positive after 6 years of illness. After 7½ years a cavity appeared in the right lung and the patient was permanently hospitalized thereafter. Marked proteinuria was first noted in the ninth year of illness and edema of the lower extremities occurred a few months later. Blood pressure remained within normal limits and an electrocardiogram was negative. The Congo red test was strongly suggestive of amyloidosis by an 85 percent retention of dye. The serum proteins fell to low levels and remained reduced in spite of frequent administration of serum albumin intravenously. Chronic gastrointestinal complaints developed about 6 months before death. A gastrointestinal series was within normal limits, however. Spells of profound weakness also began about this time. The blood nonprotein nitrogen level became elevated about 1 year before death and increased rapidly during the last few months of life.

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At autopsy no peripheral edema or serous effusions were found. Grossly the lungs contained relatively few tuberculous changes. There were several small encapsulated caseous foci in both lobes of the left lung. A 2.5 cm. cavity with a caseous lining, and a few scattered tubercles were present in the upper lobe of the right lung. The thyroid gland was nodular and moderately enlarged, weighing 50 grams. The heart showed moderate hypertrophy and dilatation of the right ventricle such as is frequently seen in chronic pulmonary disease. It weighed 420 grams. The spleen was slightly enlarged and the firm, dark red pulp was speckled with pinhead-sized, translucent, red-gray elevations which stained mahogany brown with Lugol's solution. It was a typical sago spleen. The liver was grossly normal and the test for amyloid with Lugol's solution was equivocal. The adrenal glands were enlarged and weighed about 14 grams each (normal 6 grams). The cortices stained an almost homogeneous mahogany brown with Lugol's solution. The kidneys were moderately enlarged and pale with small waxy areas in the parenchyma which stained mahogany brown with Lugol's solution.

Microscopically, tuberculosis was found only in the lungs. Here, old active foci as well as recent caseous tuberculous pneumonia were seen. Amyloid was found to be more widely distributed than was suspected from the gross examination. The thyroid gland showed extensive separation and compression of the follicles by amyloid in the stroma (fig. 12).

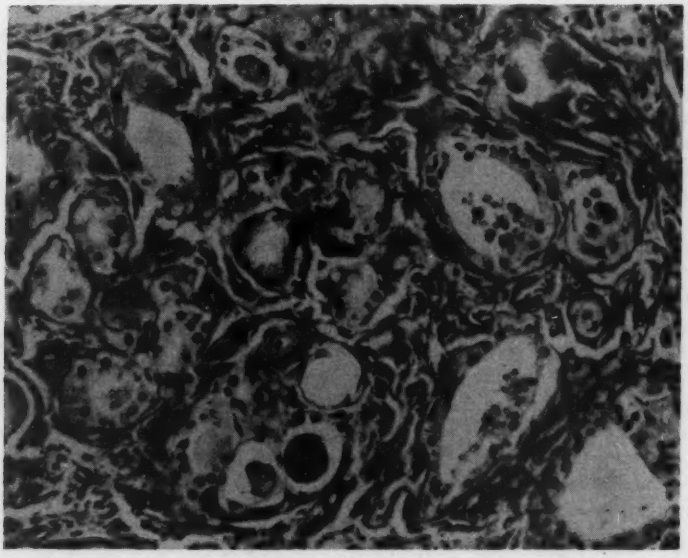

Figure 12.—Case 7. Section of the thyroid gland stained with Congo red showing amyloid deposition in the stroma with separation and some compression of the follicles.

This appeared to account for the increase in size of this gland. The heart showed small deposits of amyloid in the stroma of all layers as well as in the walls of small blood vessels (fig. 13). The spleen showed marked amyloid deposition in the malpighian corpuscles and also under the sinus endothelium. Abdominal and pulmonary lymph nodes showed amyloid deposits about the small blood vessels. The liver did not show the usual deposition of amyloid along the sinusoids but this substance was present in the walls of the small blood vessels. This type of involvement was seen also in the lungs which, in addition, had small deposits in some alveolar septa, and in the pancreas, intestines, and

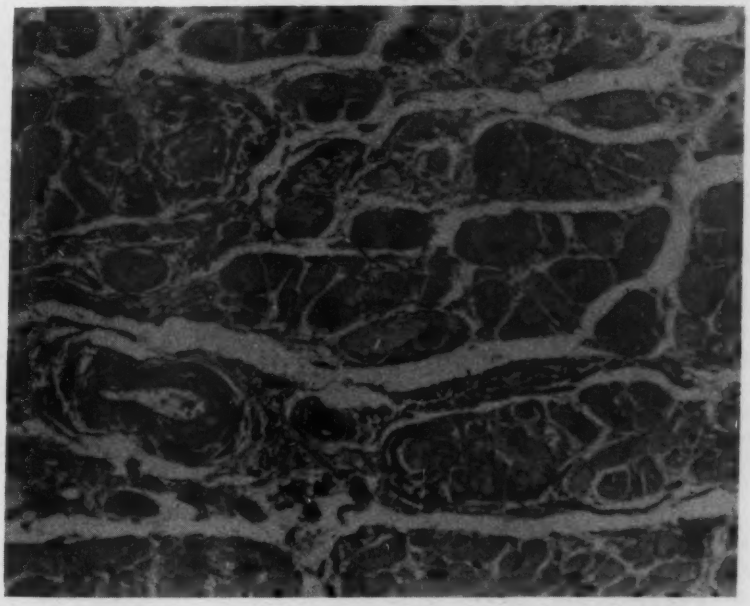

Figure 13.—Case 7. Section of the myocardium stained with Congo red showing slight deposition of amyloid between muscle fibers, in the wall of a small artery, and in the perivascular stroma.

testes. The kidney glomeruli and arterioles were extensively and diffusely amyloidotic (fig. 14). Amyloid was also deposited around the tubules causing pressure atrophy. The tubular epithelium had degenerated and many tubules were dilated and contained casts, neutrophils and tissue detritus in their lumens. Some increase in connective tissue stroma with small round cell infiltration was also seen. The adrenal cortices were almost entirely replaced by amyloid (fig. 15). The medullary tissue was fairly well preserved. Methyl violet and Congo red stains of some of the above tissues gave typical tinctorial reactions for amyloid.

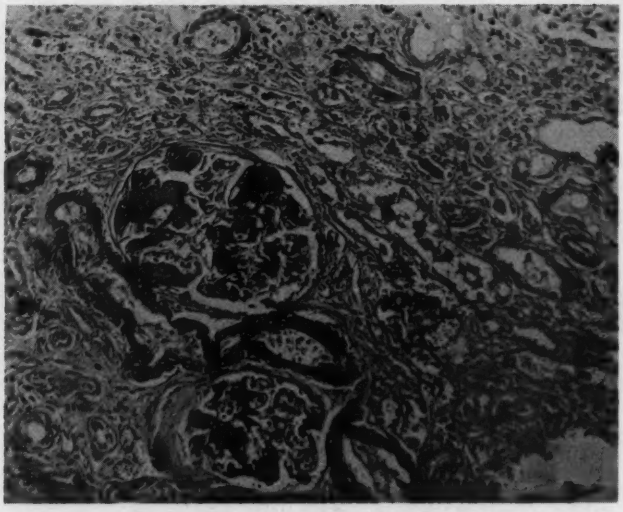

Figure 14.—Case 7. Section of the kidney (amyloid nephrosis) stained with Congo red, showing marked amyloid deposition in two glomeruli and arterioles with extensive obliteration of glomerular capillaries, amyloid deposition around some tubules, and tubular degeneration. (Compare enlarged amyloid glomerulus with normal glomerulus of same magnification in figure 11.)

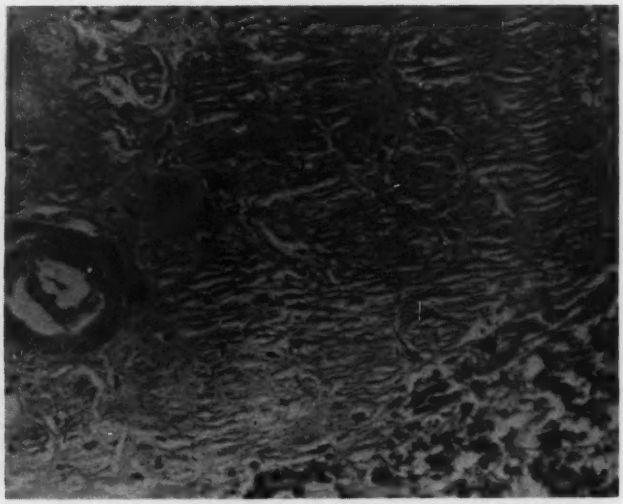

Figure 15.—Case 7. Section of adrenal stained with H and E showing nearly complete replacement of the cortex and an arteriole by amyloid, without involvement of the medulla.

COMMENT

This case illustrates the combination of the primary and secondary types of amyloid distribution. The involvement of the spleen, kidneys, and adrenal glands as well as the typical amyloid staining are characteristic of the secondary type of amyloidosis, but the absence of parenchymal involvement of the liver is unusual, since this organ is commonly rather heavily involved in secondary amyloidosis *(14)*. In the usual case the amyloid involvement of the kidneys and adrenals is less than that of the liver and spleen, whereas in this case the reverse was true. Deposits of amyloid were also found in the heart, lungs, thyroid gland, and small blood vessels generally, a type of distribution usually seen in primary amyloidosis. This case, therefore, illustrates the apparent capriciousness of amyloid deposition and the problem of classification.

The tuberculous process in this patient, although not extensive, was in a progressive stage at autopsy as evidenced by the finding of tuberculous pneumonia as well as active chronic tuberculosis. Auerbach and Stemmerman *(34)* found this to be true in most of the 468 cases of tuberculosis with amyloidosis studied by them.

The renal disease in this case was typical of amyloid nephrosis. Clinically, there were findings of the nephrotic syndrome of 1 year or more duration, with terminal uremia followed by death in a few months. This conforms with the observations of Auerbach and Stemmerman who commented that it is in persons with long-standing underlying disease (10 years in this case) that renal insufficiency usually develops and that these patients often succumb, not to the underlying disease, such as tuberculosis, but to the uremia. They also pointed out that if in the course of tuberculosis both albumin and casts appear in the urine in large amounts, a diagnosis of renal amyloidosis should be considered. Anatomically the extensive and diffuse involvement of the glomeruli and arterioles of the kidneys with narrowing or closing of lumens and of capsular spaces readily accounts for the renal failure. Although it was once believed that uremia occurred in most instances when the kidneys became contracted secondarily as a result of amyloidosis, it is now generally believed that the latter, if it occurs at all, is a rare occurrence and that the amyloid kidney associated with uremia is usually a slightly enlarged, pale, smooth kidney, as in this case *(29)* *(34)* *(35)*. Although amyloid nephrosis is usually associated with secondary amyloidosis, it has also been seen in primary amyloidosis *(36)*.

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(34) Auerbach, O., and Stemmerman, M. G.: Renal amyloidosis. Arch. Int. Med. *74*: 244-253, Oct. 1944.

(35) Noble, J. F, and Major, S. G.: Renal insufficiency in amyloid disease. Arch. Path. *8*: 762-774, Nov. 1929.

(36) Christian, H. A.: Nephrosis syndrome associated with idiopathic amyloidosis. M. Clin. North America *15*: 805-811, Jan. 1932.

It is noteworthy that such extreme replacement of the adrenal cortex by amyloid as occurred in this case was not associated with Addison's disease. Only a few cases of Addison's disease caused by adrenal amyloidosis have been reported *(37)*. Symptoms attributable to adrenal cortical insufficiency are encountered with amyloidosis of the adrenals (in this case the episodes of profound weakness) but they are usually difficult to separate from similar symptoms which might be caused by the associated tuberculosis. Appropriate laboratory studies might have revealed other findings consistent with adrenal cortical insufficiency. The presence of adrenal cortical insufficiency should be suspected in all patients with generalized amyloidosis and appropriate therapy should be instituted, particularly when a major operation is contemplated *(38)*.

The marked amyloid enlargement of the thyroid in this case was not associated with symptoms of hypothyroidism. This is usually the case *(39)*. The fact that the Congo red test on 2 occasions was not unequivocally positive is not unusual as this occurs commonly when the liver, the largest storehouse of amyloid, is not involved, or at most only slightly involved *(31)*.

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(37) Stemmerman, M. G., and Auerbach, O.: Adrenal amyloidosis. Arch. Int. Med. *74*: 384-389, Nov. 1944.

(38) Ornstein, E. A.: Adreno-cortical insufficiency in amyloid disease; preliminary report. Quart. Bull. Sea View Hosp. *5*: 21-26, Oct. 1939.

(39) Hunter, W. C., and Seabrook, D. B.: Goitrous enlargement of thyroid gland due to amyloidosis. Arch. Surg. *20*: 762-766, May 1930.

Symposium on Amyloidosis[1]

VII. CLINICAL CONSIDERATIONS AND TREATMENT OF AMYLOIDOSIS

Milton B. Rosenblatt, *M. D.* (40)

Despite the many pathologic and clinical reports in the literature, amyloidosis is encountered infrequently in the average hospital. It is only in the special institutions that it is possible to study a large series of cases. The present low incidence of the disease, as compared with its common occurrence in the past century, has been attributed to surgical and antibiotic progress in the irradication of suppurative foci. At the Montefiore Hospital for Chronic Diseases the type of case admitted made it possible to study a fairly large series (41). Of 1,727 consecutive necropsies the incidence of amyloidosis was found to be 7.2 percent. Further analysis revealed that tuberculosis was by far the greatest etiologic factor. There were 1,276 nontuberculous cases with an amyloid incidence of 1.2 percent and 451 tuberculous cases with an amyloid incidence of 24.4 percent. In the tuberculous patients with suppurative lesions such as empyema and draining bone sinuses the amyloid incidence was 35.2 percent. Similar statistics were reported by Saleeby (42), Waldenstrom (43), Fishberg (44), and others.

Although amyloidosis has been reported in every decade of life, it is essentially a disease of young adults, inasmuch as tuberculosis occurs mainly in this age group. It is practically impossible accurately to determine the time required for the development of amyloid disease. Most authors report the onset of clinical amyloidosis within from 1 to 2 years after the appearance of suppuration. At the Montefiore Hospital many patients with pulmonary tuberculosis were observed in which the

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(40) Montefiore Hospital for Chronic Diseases, New York, N. Y.

(41) Rosenblatt, M. B.: Amyloidosis and amyloid nephrosis. Am. J. M. Sc. *186*: 558-567, Oct. 1933.

(42) Saleeby, E. R.: Question of existence of amyloid casts. J. A. M. A. *84*: 344-345, Jan. 31, 1925.

(43) Waldenstrom, H.: Om Amyloidens Uppkonist och Försvinnande hos Barn. Nord. Med. Tidskr. *2*: 353, 1930.

(44) Fishberg, A. M.: Pulmonary Tuberculosis. 4th edition. Lea & Febiger, Philadelphia, Pa., 1932. p. 222.

clinical history of the disease did not exceed 2 years and in which extensive amyloidosis was present. It is unusual for amyloidosis to develop when the associated disease process is of less than 1 year's duration but exceptions have been reported *(29)* *(45)* *(46)*.

Almost every tissue of the body may be involved in amyloid degeneration but the organs most frequently involved are the spleen, kidneys, liver, and adrenals. Most of the clinical features of amyloid disease depend on the degree of degeneration of these organs. Amyloidosis of the heart will produce myocardial insufficiency, but this condition is usually associated with primary amyloidosis, which is not included in this discussion. In making a clinical diagnosis of amyloidosis we are dependent on the physiologic abnormalities produced by the pathologic changes in the organs involved. Constitutional symptoms such as pallor, anemia, and weakness are so interwoven with the underlying disease that it is inadvisable to consider them of diagnostic value. A waxy facies is not a universal finding and its absence is unimportant. The clinical features of each case depend on the organs involved and the degree of involvement. This is why so many patients show no clinical manifestations and the diagnosis is made only on postmortem examination.

The introduction of the Congo red test by Bennhold *(47)* aroused a great deal of clinical interest in the diagnosis of amyloidosis. The favorable results originally reported were confirmed by many other observers. The escape of some of the dye in the urine was originally thought to be a limitation of the test, but subsequent studies by Barker and Snell *(48)*, and Rudolph *(49)* have shown that the amount of dye which escapes into the urine is never large enough to affect the interpretation of the test. In the last few decades certain modifications in the interpretation and in the technic of the test have been developed. The tendency is now to require at least a 75 percent retention of the dye before making a positive diagnosis. Some investigators insist on practically 100 percent retention. A progressive increase in retention when the test is repeated in the same patient over a period of months is an important finding. A negative Congo red test does not exclude the diagnosis of amyloidosis.

Several refinements in the technic have been added to insure greater accuracy of the test. Probably the most important has been the withdrawal of the first specimen of blood very quickly after the injection

(45) Fagge, C.: The Principles and Practice of Medicine, Vol. 2. P. Blakiston's Sons and Co., Philadelphia, Pa. 1886. p. 487.

(46) Case 2 in Section III of this symposium.

(47) Bennhold, H.: Über die Ausscheidung intravenös einverleibten Kongorotes bei den verschiedensten Erkrankungen insbesondere bei Amyloidosis. Deutsches. Arch. f. klin. Med. *142*: 32-46, Mar. 1923.

(48) Barker, N. W., and Snell, A. M.: Congo-red test with special reference to excretion of the dye in urine. J. Lab. & Clin. Med. *16*: 262-270, Dec. 1930.

(49) Rudolph, C.: Various uses of congo red in diagnosis, prognosis and therapy. Med. J. and Rec. *137*: 296, 1933.

of the dye. In the original technic the first specimen was withdrawn 4 minutes after injection. In patients with marked amyloid disease a great deal of dye could be absorbed during these first few minutes and hence the first blood specimen could show a concentration of the Congo red which would be representative of a less amount than had been injected (0.25 cc. of 1.5 percent aqueous solution per kilogram of body weight). Accordingly, comparison of the second blood specimen (removed 1 hour later) with the first specimen (taken 4 minutes after injection) could indicate, erroneously, more retention in the blood (less absorption by amyloid deposits) than was actually the case.

In secondary amyloidosis the spleen is involved more often than any other organ. This was found in the series at Montefiore Hospital and reports by Krumbhaar *(50)* and Parkes *(51)* show similar findings. Despite the universality of splenic involvement, however, we cannot make too much use of this fact as a diagnostic aid. Our knowledge of the functions of the spleen is limited, and there are few procedures available to test splenic insufficiency. When the spleen is greatly enlarged the patient is aware of a mass in the abdomen, but as most patients are bedridden because of the underlying disease the splenomegaly produces few mechanical symptoms. The amyloid spleen is hard and nontender and the patient is usually unaware of its presence.

The liver is involved in about 60 percent of the patients with amyloidosis. It is usually palpable as a firm, smooth, nontender mass. Tremendous enlargements are occasionally observed, the liver extending well into the pelvis. The extent of the enlargement determines the presence of such symptoms as dragging sensations, fullness in the right upper abdominal quadrant, and vague digestive disturbances. When the liver is not classically enlarged, hepatic amyloidosis is difficult to diagnose. Until recent years no procedures which could record subclinical changes in hepatic function were in general use. Jaundice is rarely produced by uncomplicated amyloidosis of the liver *(18)*. Dye retention tests and studies in bile pigment metabolism have not been of great value thus far. These studies have not, however, been carried far enough to permit the formation of any general conclusions. In the last few years it has been shown that alkaline phosphatase is increased in amyloidosis of the liver. Positive results have also been obtained with the thymol turbidity test. The striking thing about liver involvement is that the anatomic extent of the hepatomegaly shows little relation to the symptoms produced or to the findings of the tests of hepatic function.

Adrenal involvement occurs in about 40 percent of the patients. A few authentic cases of Addison's disease caused by amyloidosis have

(50) Krumbhaar, E.: Textbook of Medicine, edited by Cecil, R. L., and Kennedy, F.: W. B. Saunders Co., Philadelphia, Pa., 1927. p. 1160.

(51) Parkes, E.: Lardaceous or cholesterine disease. British & Foreign Medico-Chirurgical Rev. *14*: 319, 1854.

been reported *(52) (53)*. Despite the relatively high incidence of adrenal amyloidosis, however, characteristic symptoms of adrenal insufficiency are exceedingly rare. I have never observed it. Patients with generalized amyloidosis show asthenia, hypotension, and failure of the peripheral circulation, but these symptoms are best interpreted as part of the syndrome of the basic disease.

From the earliest description of amyloidosis in the literature up to the present, it has been realized that the most significant features were those produced by involvement of the kidneys. Many of the patients originally reported by Bright really had amyloidosis. The most common sign of renal involvement is albuminuria. This finding is of greatest significance when it is quantitatively progressive over a period of months. The absence of albuminuria, however, does not rule out renal amyloidosis. Hyaline and granular and waxy casts are found in the urine in varying numbers, particularly in the advanced stages. Hematuria and pyuria may also be present and should not, therefore, be considered as ruling out a diagnosis of amyloidosis. Polariscopic examination of the urine occasionally shows doubly refractile lipoid bodies. Urinary concentration is generally unimpaired. In about 10 percent of the patients the amyloid involvement is so extensive that renal insufficiency results. When this occurs the manifestations are similar to those in chronic nephritis, i.e., fixation of the specific gravity of the urine, nitrogen retention, and uremia, but even when the amyloid kidney has produced uremia it is found at autopsy to be of normal size or slightly enlarged.

A sequence of clinical events is produced in renal amyloidosis which is most interesting and often gives the clue to the diagnosis. Although the nephrotic syndrome does not occur in all patients with renal amyloidosis, it occurs with sufficient frequency to make it of utmost significance. The pathogenesis of amyloid nephrosis has for its starting point the proteinuria. Inasmuch as albumin has the smallest molecular weight, it passes most easily through the renal glomerular unit when the permeability has been impaired. Microscopic examination of the amyloid kidney may show extensive destruction of glomeruli and replacement by amyloid. A definite mechanism for permitting serum albumin to filter through the glomeruli and into the urine is, therefore, present.

As the albuminuria increases it is followed by a depletion of the serum albumin. Although this is not quantitatively proportionate it is nevertheless generally consistent. When the serum protein is diminished there follows a lowering of the colloid osmotic pressure of the blood. Eventually a level is reached at which the osmotic pressure

(52) Hunter, W. C., and Rush, H. P.: Amyloidosis of adrenals as cause of Addison's disease; report of case with review of literature. Ann. Clin. Med. *5*: 404-412, Oct. 1926.

(53) McCutcheon, M.: Relation of Addison's disease to amyloidosis. Am. J. M. Sc. *166*: 197-200, Aug. 1923.

is no longer able to counteract the hydrostatic pressure in the capillaries and edema is produced. The subcutaneous edema fluid is poor in protein and similar to that in lipoid nephrosis. Elevated cholesterol values have been found in about half the cases. Although the edema of renal amyloidosis is usually moderate and confined to the lower extremities, ascites and pleural effusions may be present.

The absence of hypertension is an important diagnostic sign and helps to differentiate this condition from chronic nephritis. The hypotension is probably caused by the debilitated condition of the patient. In those instances in which renal amyloidosis terminates in uremia hypertension may be present. Cardiac hypertrophy and retinal changes have also been observed.

Amyloidosis is a generalized disease affecting the most important organs of the body. Despite this fact the course of the illness is essentially that of the primary disease. Amyloidosis of the spleen and of the liver apparently are not directly responsible for the fatal termination. Adrenal insufficiency with death may be caused by amyloid but reports of such an occurrence are rare. Even the kidney damage, which presents the most striking clinical manifestations of the disease, produces a fatal outcome in only a small percent of instances. We may, therefore, conclude that in over 90 percent of the patients amyloidosis is not the direct cause of death. The presence of amyloid is usually an indication of progressive disease but patients with amyloidosis complicated by the nephrotic syndrome of 15 years' duration have been reported.

We may conclude therefore that if a patient is able to survive for many years with clinical manifestations of amyloidosis, this condition is not a contraindication to specific therapy of the primary condition. Experimental evidence and clinical observations have shown that amyloid disease may regress if the underlying cause is removed. We have little hesitancy in using antibiotics for patients with amyloidosis. Surgical therapy is still undertaken with caution because of the poor general prognosis of the patient with amyloidosis. If the patient has a reasonable chance to survive an operation, the presence of amyloid should serve as a stimulus for intervention. It is only by providing a definitive approach to the primary disease, usually tuberculosis, that we can offer the patient a chance of recovery from amyloidosis. Recovery from amyloidosis has been reported on several occasions *(54)* *(55)*, but it is still unusual, chiefly because the patient succumbs to the primary process. I have observed 2 cases of clinical recovery which I shall review briefly.

(54) Walker, G. F.: Case of recovery from amyloid disease. Lancet *2*: 120, July 21, 1928.
(55) Gairdner, W., in discussion of Delafield, F.: Diseases of kidneys. Trans. Assoc. Am. Phys. *6*: 149, 1891.

CASE REPORTS

Case 8.—A 34-year-old man was admitted to the Montefiore Hospital in August 1931 with a history of productive cough and fever of 5 months' duration. Examination disclosed bilateral, fibrocaseous infiltrations with a large cavity in the upper lobe of the right lung. The sputum was positive for *Mycobacterium tuberculosis*. Shortly after admission an artificial pneumothorax was induced on the right side. This was complicated by a mixed empyema. Aspiration and irrigation were unsuccessful and a thoracotomy was performed in May 1932. In the ensuing months improvement was continuous and by August 1933 the patient was in excellent condition with negligible drainage from the thoracotomy sinus. His pulmonary condition had also improved with apparent closure of the cavity on the right side and absorption of the infiltrations on the left. The patient was discharged from the hospital in August 1934, with persistently negative sputum.

The amyloid history is most interesting. The patient had a progressive albuminuria following his admission in August 1931. In July 1932, 2 months after the thoractomy, his liver was palpable. In October 1932, the total serum proteins were reduced to a level of 4.32 grams and peripheral edema was present. In February 1933, the Congo red test which had previously shown partial retention showed 100 percent retention. The spleen which had been barely felt previously was definitely enlarged. The edema was also more extensive. The progression of the amyloid manifestations had taken place at a time when the pulmonary disease was showing marked improvement.

Resolution of the amyloidosis became apparent in November 1934 when the Congo red test showed equivocal retention. The liver was still enlarged but the spleen could no longer be felt. Peripheral edema was very slight and the albuminuria had been reduced to 2 grams per day. The serum proteins were elevated to 6.7 grams. On the patient's last check-up in the latter part of 1935, hepatomegaly, splenomegaly, and edema were no longer present. The albuminuria, although further reduced, was still present. The general condition of the patient was excellent.

Case 9.—A 22-year-old man became ill in 1933. In 1934 an artificial pneumothorax was induced for a cavity in the upper lobe of the left lung. This was complicated by a tuberculous empyema for which a thoracotomy was performed in 1936. Later that year an 8-rib thoracoplasty was performed in an attempt to obliterate the empyema cavity on the left side. In 1937 the thoracoplasty was revised but this operation was also unsuccessful. In 1939 an abscess of the left anterolateral chest wall was incised. In 1940 the patient had another revision of the thoracoplasty which was also unsuccessful. There was continuous drainage from multiple sinuses on the lateral chest wall. Between 1944 and 1946 several fistulectomies were performed but the sinuses reopened.

In 1947 penicillin was given parenterally and locally without producing any improvement. Tyrothricin was also instilled into the empyema cavity without altering the course of the disease.

In 1947 the patient was semicachectic. The left hemithorax was markedly shrunken as a result of fibrosis and the multiple rib resections. There were 2 large sinuses in the left axilla from which drained a profuse foul purulent discharge which required constant change of dressings. The upper lobe of the right lung contained a fibrotic lesion. Examination of the sputum and gastric contents were negative for *M. tuberculosis*. In summary, the patient had had a tuberculous empyema on the left side since 1936 which had been draining continuously since 1939. Streptomycin therapy was instituted in April 1948 and continued through the early part of June 1948. A total of 100 grams was given parenterally. There was no local treatment. Examination in December 1948, showed that both sinuses had closed. The patient's general condition had improved greatly and he had gained 30 pounds since starting treatment.

The amyloid history began in 1940 when progressive albuminuria was noted. Shortly after this the patient began to complain of dull abdominal pain and diarrhea. The abdomen became enlarged and the liver was palpable. The Congo red test showed 100 percent retention. Studies in December 1946 showed impairment of urinary concentration, the liver edge 3 cm. below the costal border, an alkaline phosphatase of 12.9, and cholesterol of 161 with a normal ratio of esters. The total serum proteins were 6.6 grams and there was no edema.

Between December 1946 and January 1947 an attempt was made to treat the amyloidosis with liver extract parenterally, yeast, and a high-calory, high-protein diet. There was no response to this treatment. Examination of the patient in April 1948 showed slight progression of his amyloidosis. The urinary concentration was further impaired, the liver edge was 5 cm. below the costal border, and the alkaline phosphatase was 18. In addition, the prothrombin time was increased to 24.5 seconds and the thymol turbidity test was positive. A check-up in December 1948 about 6 months after discontinuing the streptomycin treatment revealed a total serum protein level of 8.2 grams. Renal function showed marked improvement. The liver had diminished in size and, of even greater significance, it felt soft. The patient was last observed in May 1949 at which time the liver was barely palpable.

In the past century many unsuccessful attempts were made to introduce specific therapy for amyloid degeneration. Potassium iodide, liquor potassii arsenitis, and various alkalies were tried. Iodide therapy was probably beneficial in those instances in which the amyloidosis was caused by syphilis. In 1932, Whitbeck *(56)* reported excellent

(56) Whitbeck, B. H.: Liver meal in treatment of amyloidosis in surgical tuberculosis. J. Bone & Joint Surg. *14*: 85-92, Jan. 1932.

results with liver therapy in patients with amyloidosis caused by osseous tuberculosis. Favorable results were also reported by Jacobi and Grayzel (7). This work was received enthusiastically but attempts to duplicate it in patients with amyloidosis caused by pulmonary tuberculosis have generally been unsuccessful. I have never believed that liver therapy, either parenterally or orally, contributed more than general supportive treatment. Cohen (57) while noting some improvement in patients with amyloidosis following liver therapy could not attribute the improvement specifically to this treatment.

The best results with liver therapy were obtained in those patients in whom the primary disease was relatively benign, such as those with osseous tuberculosis. In patients with amyloidosis and progressive pulmonary tuberculosis the results were unsatisfactory. The approach to the treatment of amyloidosis is, therefore, that of treatment of the primary disease. If this can be eradicated or controlled the amyloidosis will show regression. Supportive therapy in the form of liver or special diets is not condemned, but the use of such measures should not obscure the main issue which is the treatment of the primary disease.

CONCLUSIONS

Amyloidosis occurs chiefly as a complication of progressive pulmonary tuberculosis. It may involve every organ of the body but is found most frequently in the spleen, kidneys, liver, and adrenals. The liver and spleen, despite the frequency of implication, rarely produce symptoms of functional change. The characteristic signs of amyloidosis are produced by involvement of the kidneys. The manifestations range from albuminuria to the fully developed nephrotic syndrome. In a small percent of patients renal amyloidosis terminates in uremia. Secondary amyloidosis may persist for many years depending on the duration of the primary condition. If the cause of the amyloidosis is eradicated, the disease will retrogress. This has been shown both by experimental and clinical observations. The presence of amyloidosis should serve, therefore, as a stimulus for definitive treatment of the primary condition if this is at all possible.

(57) Cohen, S. (Rochester, N. Y.): Amyloidosis complicating tuberculosis—diagnosis, prognosis and treatment. Ann. Int. Med. *19*: 990-1002, Dec. 1943.

Psychodynamic Factors in a Case of Self-Inflicted Wound

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A REPORT is presented on the successful treatment by psychiatric methods of a soldier suffering from almost total disability of the right hand and right arm following an accidental self-inflicted gunshot wound. It is hoped that this case may illustrate some psychologic factors which accompany and complicate such injuries.

THE ORGANIC INJURY

A 19-year-old male recruit was first admitted to Murphy General Hospital in December 1948, with a penetrating wound of the right hand without arterial or neural involvement, with the point of the bullet in the middle surface of the hand at the head of the second metacarpal. There were associated fractures of the heads of the second, third, and fourth metacarpals. The patient states that the wound was caused by the accidental discharge of a .22 caliber rifle while he was on leave. An immediate surgical débridement was performed with removal of the missile.

Despite a technically successful operation the patient complained of extreme pain in the hand, failed to cooperate with the orthopedists and physical therapists, and stated that the skin of the entire hand was so sensitive that he could not endure its being handled. In view of his resistance to treatment, no progress was made in the direction of mobilization. The skin over the entire dorsum of the hand became tense, red, and smooth; and extreme edema of the entire hand developed together with increasing wasting of the muscles of the hand and arm. The ward surgeons believed that he was deliberately opposing their efforts at rehabilitation, and it was rumored by other patients on the ward that the patient deliberately let his arm hang over the side of the bed at night apparently in an effort to increase the edema. Be-

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cause of this, he was first referred to the psychiatric service about 2 months following his injury. Psychiatric treatment was instituted, in the form of regular 50-minute interviews, two or three times a week for the next 6 months.

THE THERAPEUTIC INTERVIEWS

At the time of the first interview the patient was exceedingly aggressive and uncooperative. A cue for the attitude of the therapist during these early hours of treatment was taken from the fact that the patient expressed a great deal of anger at what he considered to be the unwarranted attempts of the doctors and nurses to "force" therapy of his hand. It was decided that the therapist should ignore the hand and concentrate from the beginning on the attitudes of the patient. Therefore, the early interviews were largely concerned with the patient's dissatisfaction and anger with the doctors and nurses, his belief that they doubted his suffering and his contention that his hand would get well if they would only leave it alone.

Late in the first month of treatment the patient was asked to talk about his family, a subject which he had, up to this point, avoided in interview and also in reality, for although his home was nearby, he had not visited it during his stay in the hospital. He spoke with vehemence about his family and stated that he wanted nothing more to do with them. He described the family group as consisting of his paternal aunt, his father, and two older sisters. His mother had died when he was 8 or 9 years old, and he had then been taken into the aunt's home. He expressed great dislike for his aunt and during the next few interviews spoke largely of how much he hated her. He described her as a domineering, interfering, unpleasant person "who never smiled." He stated that she had never understood him, that she refused to allow him to lead his own life, and that he did not ever wish to see her again. During the next few interviews he illustrated the violence of his dislike by saying that if his aunt should ever visit the hospital, he would hide rather than meet her. Some exploration of this feeling was undertaken, and it was found that the patient had extremely violent phantasies of striking his aunt, and he was able eventually to discuss several occasions in the past when he had been tempted to strike her with objects close at hand. (The therapist noted at this time that all of these phantasies referred to the injured right hand, but made no reference to this fact.)

At this point a change occurred in the subject matter of the interviews. The patient began to speak of his mother and how great a contrast there was between her and his aunt. He described his mother as a gentle, kind, and understanding person and stated that he had never gotten over the loss he had sustained in her death. In speaking of this, he suddenly stopped in amazement and remarked that he was surprised to find that he had no memory of her death. He could only recall her being ill in the hospital and then his father about 2 weeks later stand-

ing at a window and telling him that "she would never come back." He spoke of how unhappy this made him and in the next interview described trips that he had taken alone to the town in which she was buried and how he carried flowers to her grave and lay there thinking of her for hours at a time. He had never told anyone else of these adventures.

At this time, when the patient had been in therapy about 2½ months, he spontaneously initiated a devise for producing visual phantasies. One day while looking out the office window, he stated that it reminded him of something in his past. He was asked to imagine the window as a screen and to relate what he could see reproduced on that screen. The only image he obtained (and one which recurred throughout the treatment) was that of an empty room with light streaming down from a window and illuminating a myriad of dust particles floating in the air. He remarked several times that there was "nothing else in the room—and yet it seems as if there should be something else there—it's as though I am looking for something."

In the next interview the patient stated that occassionally when he lay before his mother's grave he would imagine digging up the coffin and opening it, but he could not imagine why he should think of such a strange thing. It was suggested to him that perhaps he wished to prove that the coffin would be empty and that his mother was still alive. He admitted that this was true and that he had actually had this phantasy, although he would not have dared speak of it.

At the end of the third month of treatment the patient showed evidence of a positive transference, bringing to the therapist, as though they were gifts, bits of information which neither then nor later seemed to have much significance but which he always said were things he could never tell anyone else. He also suggested that perhaps he could tell more if the interview were conducted on his ward some night when it was dark because he could talk more easily in the dark.

Although his attitude was more cooperative at this point, his general behavior on the ward, in the clinic, and in physiotherapy was still hostile, uncooperative, and suspicious. The members of the physiotherapy department were seriously concerned over continuing treatment, and there was some talk of amputation by the orthopedic surgeons in case no improvement occurred within the next month.

At the beginning of the fourth month of treatment the patient talked again of his mother. He recalled a schoolboy fight in which he had engaged during his first year of school and of how well he thought his mother had handled the situation by inviting the injured child to a party at the patient's house the next day. He said this made him ashamed, as though he had hurt his mother. He recalled his dislike of fighting and spoke of another time, when in junior high school, he had been ridiculed into a fight and an older woman had said, "What a vicious right arm you

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have!" At this point the therapist remarked that it was interesting how frequently he made references to the use of this right arm and hand and that all these references were to acts of violence. He seemed to accept this and agreed that it was strange. From that time the patient seemed aware in the interviews that therapy was directed toward his hand, although he expressed some doubt concerning the possible relationship between his emotions and his injury.

Because there was at this time growing concern on the part of the surgeons and the chief of the physiotherapy section as to the increasing edema and what was considered the imminent loss of function of the hand, the psychiatric staff believed that the focus of the work would have to be placed more directly on his refusal to cooperate in treatment. At the suggestion of the visiting neuropsychiatrist, it was therefore pointed out to the patient, after some inquiry into how faithfully he performed the exercises prescribed for him, that he didn't seem to want the hand to get well. He readily admitted this and indeed said that he had known for a long time that he did not want it to get well, but that he could not understand why. He admitted that it would be a severe handicap to lose the hand but that somehow it did not seem to matter. Following this interview, although the patient did not cooperate any more fully with the physical treatment, it was understood tacitly between the patient and the psychiatrist that the major subject of inquiry and treatment was to determine why he could not tolerate having the hand get well.

The fact that the hand was so often associated in his thoughts with acts of violence was pointed out to the patient, and during the next two or three interviews following this he stated that his hand disgusted him, that he could not bear to hold it up where he could see it, that it reminded him af a horror movie which he had seen as a child in which a clawlike hand was associated with murder and violence and, finally, that he would just as soon have it cut off.

In the fifth month of treatment the patient discussed some of his recent experiences on the ward. One of these involved the night when he had awakened with symptoms of an anxiety attack (the first anxiety that he had reported during treatment) and wandered out to the desk at the nurses' station. Here he remarked on the light streaming through the dust particles in the air and again related this to the phantasy previously mentioned. A week or so later, he reported having been out to a taproom near the hospital; while sitting in the lighted room, he had experienced a good deal of anxiety and had felt as though he were "close to some answer" as he watched the light pouring down on the head of a blonde sitting across the room with her back to him.

In two subsequent interviews, he again discussed his aunt and at this time spoke of how he had come into the Army to get away from home. For the first time he described the incident immediately preceding his induction. He said that he had been visiting at another aunt's

apartment and had left the house after she had, but had subsequently gone back to get a possession he had left behind. He had been seen re-entering by the landlady. Later that day, the aunt with whom he lived accused him of attempting to steal something. His resentment resulted in his escape by enlistment.

Finally, toward the end of the fifth month of treatment and at a time when the surgical service believed that the nerve supply to the hand had probably been irreparably injured, the patient recalled an incident in his childhood which he said he had forgotten until then. He remembered awakening one night at the age of 4 or 5 years and saw light streaming out of the kitchen. He heard a great deal of noise within and on creeping to the door, saw his father and mother arguing. In the midst of the argument he saw his father lift a pan of hot grease from the stove and throw part of it at his mother, burning her leg. He said that at the time he felt like choking his father. It was only with the greatest difficulty that he had been able to relate this incident, because it was quite a terrible thing to have such thoughts about one's father. In the next interview he wondered briefly and rather vaguely if he thought his father could have had something to do with his mother's death and again recalled his anger when, after the funeral, his father said, "There's no way to get her back."

In the next few interviews the intensity of his concern and his anxiety appeared to mount, and finally, following 1 hour in which he was unable to speak, he spoke with extreme anxiety about another incident which had occurred in his childhood and which he said he had forgotten until then. This time he was playing ball with some other children and had walked away from the field carrying either a glove or bat when he was suddenly seized from behind by someone attempting to stop him. He grappled with this person and eventually succeeded in turning around and striking his assailant so forcibly and repeatedly across the face that finally he knocked him to the ground, only then to discover that it was the sister of one of the boys, dressed in slacks. This memory disturbed him a great deal. He spoke of how ashamed he was and of what a terrible thing it was to hit a girl.

In the next interview the patient was returned to this topic by the doctor. He said that he had often thought of how rotten a thing it was to do. When asked to explain his feelings, he said, "That girl has probably grown up to be somebody's mother, and if anyone struck my mother, I'd break every bone in my hand hitting him." It was pointed out to him that although he hadn't broken every bone in his hand, he had broken a goodly number. He looked down in surprise at his hand, started to say something and then paused, explaining that he had had a silly thought. When pressed for his thought, he finally said that he had wondered if this injury had come about in punishment to him for not having hit his father as he wished to do the night he saw him throw the hot grease at his mother.

In the next interview the patient had great difficulty in talking, but finally when the examiner repeated to him the content of the last interview, emphasizing the three things the patient had spoken of, i. e., his father striking his mother, his striking the little girl, his concern about someone striking his mother and his own feeling of wanting to strike his father, he then became very anxious and said that he could not think about it any more. After some reassurance the patient became relaxed and said that once more he was conscious of the empty room with the sunlight streaming through the window, but that this time he felt that there was something in the room at which he did not want to look, something he was running away from. He was asked to look at this thing, but he said he could not.

The next morning before the regular interview, the patient came excitedly to see the psychiatrist saying that during the night he had remembered some further incident and had forgotten it again on awakening but that it had returned to him again while sitting in the physiotherapy clinic awaiting treatment. One night, when he was 4 or 5 years old, he had gone to the pantry to get some jam and his father, seeing the light in the kitchen, had followed and reprimanded him. In anger the patient swung around with the jam jar in his hand and struck his mother, who had unexpectedly entered the room, squarely in the pit of her stomach with the jar. Everyone was excited; his mother was in pain, and he was sent to bed having been told that "boys who hit their mothers aren't wanted in this house." Try as he would to explain that his act was entirely unintentional, he was not believed. Finally, he crept into his parents' bedroom and there caressed his mother while his father stolidly and angrily turned his back to him from across the room.

THE THERAPEUTIC RESULT

After this interview the patient returned to his ward but the next morning appeared in great excitement to demonstrate that his hand was now entirely normal in size and that the edema had completely disappeared. The patient maintained that he had not changed the position of the hand in any way from that in which he had been carrying it for the preceding 6 months. That same day he requested extra treatment in physiotherapy and on that same afternoon asked to have his long, misshapen nails cut and to have his finger exercises. Passive exercise was carried out under sedation with 0.4 gram of sodium amytal. About 48 hours after this interview described, the patient had complete voluntary motion of all digits, wrist, and elbow, and there appeared to be no calcification or loss of neural function.

Equally dramatic was the way in which the lifting of this particular segment of childhood amnesia dispelled other areas of amnesia throughout his life history, some of which had not been suspected. In the first interview after his recall of the above decisive incident, the patient suddenly found that he remembered the circumstances of his mother's death and funeral. He recalled in amazement that she had died of

"something wrong with her stomach" and then spontaneously said, "Why, Doc, I must have thought I killed her—I know I thought that. I guess that's why I couldn't remember it—but I didn't kill her, did I?" After reassurance that his blow couldn't have had anything to do with his mother's death 4 or 5 years later, he said "It's funny how even though I didn't remember, it could make me think such a crazy thing." In addition, within the next few interviews it became clear to both the patient and the physician just why the incident in which he was accused of taking something from his aunt's apartment should have precipitated his flight into the Army. It was a repetition of the earlier situation in which he was accused of doing something wrong and had not been allowed to present his own defense.

As dramatic as the change in the patient's hand was the change in his behavior and mood. He became cheerful, worked vigorously in physiotherapy several times a day in an effort to increase the strength of his hand, voluntarily offered his services as a helper in that department, began to lead a full and active social life, and was full of plans for the future.

The interviews were gradually reduced in number, and although it was believed that there were still unexplored areas, particularly in relation to the patient's sexual phantasies which he had avoided throughout the treatment, his recovery was sufficient to warrant discontinuance of further interviews.

DISCUSSION

This case report is a dramatic illustration of the relationship of the unconscious psychic activity to an overt organic condition. The psychodynamics elicited follow the pattern observed in conversion hysteria. In such a situation a part of the body is used to express symbolically an unconscious conflict. The conflict and its attendant guilt had remained unconscious in this patient for many years only to be precipitated by a symbolic and stressful situation and ultimately expressed in the punitive attempt to destroy the offending hand and arm.

In one sense, the gunshot wound of the hand may be construed as a suicidal equivalent, but fortunately for the patient he elected, instead of destroying himself, to destroy the offending arm. By destroying his hand and arm he would have succeeded in achieving atonement and in preventing himself from ever repeating the guilt-laden aggressive act again. Although only the aggressive component relating to the arm was elicited, it would not be correct to assume that this aggression is the only factor to be considered in the psychodynamic formulation. It is well known that the involved limb in conversion hysteria serves as a libidinal symbol, and it is thus to be expected that continued study might have demonstrated other unconscious phantasies, related to the classical content of the castration complex.

Of particular interest and gratification in this case was the recognition by the various ward surgeons that there was something more than an ordinary organic condition present. By this recognition and the subsequent psychiatric consultations a degree of teamwork was established which eventually resulted in salvaging the patient.

Inasmuch as this report concerns itself with a patient with a self-inflicted gunshot wound, it should be remembered that not all such patients would necessarily show the psychodynamic formulation presented here. All such patients should, however, have the benefit of adequate psychiatric consultation.

Carbon Tetrachloride Nephrosis

Report of Patient Treated Conservatively

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A CASE of anuria resulting from the inhalation of carbon tetrachloride fumes by a man who had been drinking alcoholic beverages in excess is reported to emphasize the dangers of carbon tetrachloride and to indicate the favorable prognosis when proper treatment is instituted. An unusual feature of this case, which we believe never to have been previously reported, was the marked kidney enlargement during the course of the disease, as demonstrated roentgenographically.

Incidence.—Until recent years, lower nephron nephrosis caused by inhalation of carbon tetrachloride fumes has not been considered a common entity. With increasing knowledge and awareness of the disease, however, particularly in the last 5 years, more case reports have been published. Farrier and Smith (2) recently reported a total of 12 cases with 5 deaths in 5,000 admissions over a 2-year period. This was twice the number of cases of subacute bacterial endocarditis, not a medical rarity, diagnosed during the same period of time in their hospital.

Etiology.—The inhalation of carbon tetrachloride fumes affects primarily the kidneys, whereas the ingestion of the liquid causes lesions in the liver (3). Damage to both the liver and the kidneys (the hepatorenal syndrome) has occasionally been reported (4). Konwaler and Noyes (5) list the factors which encourage poisoning by carbon

(1) Reese Air Force Base, Lubbock, Tex.

(2) Farrier, R. M., and Smith, R. H.: Carbon tetrachloride nephrosis; frequently undiagnosed cause of death. J. A. M. A. 143: 965-967, July 15, 1950.

(3) McGee, C. J.: Lower nephron nephrosis; carbon tetrachloride poisoning with report of 3 cases. Am. J. M. Sc. 218: 636, Dec. 1949.

(4) Dillenberg, S. M., and Thompson, C. M.: Carbon tetrachloride poisoning; report of 20 cases with one death. Mil. Surgeon 97: 39-44, July 1945.

(5) Konwaler, B. E., and Noyes, C. B., Jr.: Carbon tetrachloride poisoning; report of cases. California & West. Med. 61: 16-20, July 1944.

tetrachloride as (1) alcoholism, (2) excessive exertion, (3) the ingestion of a heavy meal prior to exposure, and (4) exposure to heat. They further state that alcoholics and those having nephritis, diabetes mellitus, myocardial degeneration, or high blood pressure should not be permitted to work with carbon tetrachloride.

Pathology.—Liver damage, when present, is evidenced by central necrosis. The lesions of the kidney are those of lower nephron nephrosis. Konwaler and Noyes *(5)* reported a fatal case with "large white kidneys," weighing 350 grams each. McGee *(3)* reported a case in which the microscopic renal lesions were pigment casts, degeneration of the ascending limbs of Henle's loop, interstitial inflammation at the cortico-medullary junction, and foci of venous thrombosis.

Symptoms.—Exposure to the fumes of carbon tetrachloride results in varying degrees of illness which cover a wide spectrum of clinical states. This spectrum encompasses the person who is stricken with influenzalike symptoms for a day or two, with or without albuminuria, and the person who develops complete anuria. Between these two extremes are many degrees of illness. The symptoms most commonly noted are severe headache, nausea, vomiting, prostration, giddiness, muscle pains, and diarrhea *(4)*. The nausea and vomiting seem to be a universal problem, and, if accompanied by oliguria or anuria, constitute a complicating factor in fluid therapy. The vomiting is usually intractable. A hemorrhagic diathesis is also mentioned *(3)* *(4)*.

Treatment of this disease must be predicated on the following fundamental considerations:

1. The kidney damage is reversible and the disease self-limited. According to Kugel *(6)*, tubular regeneration begins on the third day after the injury and is complete on the fourteenth day. Spontaneous diuresis occurs by the eleventh or twelfth day.

2. Most patients who die during treatment for anuria or oliguria resulting from poisoning by carbon tetrachloride die as a result of overtreatment. The literature is replete with reports of patients who succumb in congestive heart failure as the result of overzealous fluid therapy *(7)*.

3. Other patients die as the result of potassium intoxication *(7)* *(8)*.

In general, then, the purpose of treatment is to keep the patient alive until the return of renal function. The patient is assumed to have

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(6) Kugel, V. H.: Management of acute toxic nephrosis. Am. J. Med. 3: 188-205, Aug. 1947.

(7) Friedberg, C. K.: Congestive heart failure of renal origin; pathogenesis and treatment in 4 cases of carbon tetrachloride nephrosis. Am. J. Med. 9: 164-174, Aug. 1950.

(8) Hicks, M. H.; Crutchfield, A. J.; and Wood, J. E.: Intestinal lavage in potassium intoxication of lower nephron nephrosis. Am. J. Med. 9: 57-61, July 1950.

lost about 1,000 cc. of fluid per day by respiration and perspiration. If this amount of fluid, plus the amount of fluid lost by emesis and urination is replaced, and the amount of sodium and potassium administered is rigidly restricted, most of the pitfalls of overzealous therapy can be avoided *(9)*. A semblance of nutrition is maintained and ketosis is minimized by the liberal administration of dextrose and vitamins. Serial electrocardiographic studies are made for detecting the occurrence of hyperpotassemia. If hyperpotassemia should occur, such methods as the use of the artificial kidney *(7)*, intestinal lavage *(8)*, peritoneal lavage *(10)*, or replacement transfusions *(7)* become necessary.

After diuresis has begun, urination may be excessive and the patient may pass in excess of 10,000 cc. in 1 day *(9)*. At this time, hyponatremia, hypopotassemia, hypocalcemia, and dehydration must be avoided by proper replacement therapy. It is conjectured that the diuresis is caused by the poor concentrating power of the convalescing tubules and/or to the previous overhydration.

CASE REPORT

A 27-year-old white male cook presented himself at the dispensary on the morning of 6 October 1950 complaining of sore muscles, nausea and vomiting, and a cough with the production of "yellow phlegm." Physical examination at this time revealed nothing of significance except a markedly reddened pharynx, slight epigastric tenderness, and a temperature of 102° F. He was admitted to the hospital with the diagnosis of influenza and therapy with aureomycin was begun. That evening, the nurse reported that the patient had not voided since admission. Catheterization was attempted, but was unsuccessful. Several hours later the patient spontaneously voided 60 cc. of dark red urine. Urinalysis revealed a specific gravity of 1.021, acid reaction, 4 plus albumin, 6 to 8 erythrocytes and an occasional leukocyte per high power field. No casts were seen at this time, but several days later granular casts appeared in the urine.

Further questioning of the patient revealed that he apparently had not urinated for the previous 48 hours. He stated that he was perfectly well until 30 September 1950, at which time he consumed, over a period of several hours, about a quart of whiskey and an unknown quantity of beer. He was able to drive to work the next morning. He drank an unknown quantity of beer daily up to and including 3 October. On 4 October, at 0800, a repairman cleaned the motors of the refrigerator units in the kitchen in which the patient was working. A 1-gallon pail of carbon tetrachloride, which was open to the air, was used for this purpose. The patient was seated several yards away in front of an open window

(9) Muirhead, E. E.: Lecture on the Treatment of Lower Nephron Nephrosis. South Plains Medical Society Meeting, Lubbock, Tex., September 1950.

(10) Odel, H. M.; Ferris, D. O.; and Power, M. H.: Peritoneal lavage as effective means of extrarenal excretion. Am. J. Med. 9: 63-77, July 1950.

for the hour and a half that the work was in progress. That night the patient drank several more cans of beer. He began to feel sick the next day and reported to the dispensary about 48 hours after exposure to the fumes of carbon tetrachloride. He had no insight as to the relation of the carbon tetrachloride fumes to his illness and it took 2 days of persistent probing into the history before he remembered that he was in the vicinity of carbon tetrachloride fumes.

The patient was extremely ill for 2 weeks. Each day he passed more urine until the tenth day after exposure when the amount reached 1 liter in 24 hours. On the eleventh day, he voided 2,900 cc. and on the fifteenth day, 4,800 cc. of very dilute (sp. gr. 1.007) urine, at which time vomiting ceased. The vomiting had been intractable and had lasted 2 weeks. He failed to respond to atropine, sedation with seconal given rectally, pyridoxine and vitamin B complex intramuscularly and intravenously, or to intramuscular injections of liver extract. During the greater part of these 2 weeks, he complained almost constantly of pain in the left upper abdominal quadrant. The abdomen was extremely tender to palpation and there was marked left costovertebral tenderness to deep percussion. A flat film of the abdomen taken on 9 October revealed the left kidney to be enlarged to about twice the normal size, with the lower pole reaching almost to the transverse process of the fourth lumbar vertebra. The right kidney could not be definitely visualized. Neither kidney was palpable. Serial roentgenograms revealed no decrease in the size of the left kidney until 23 October, 19 days after exposure. An intravenous pyelogram on 6 November, 1 month after admission, revealed a normal urinary tract. The kidneys at this time appeared to be of normal size.

On the eighth, ninth, and tenth days of illness, periorbital edema appeared, apparently the result of excess sodium administration. At no time, however, was there any respiratory distress. Neither were rales in the lung bases ever noted nor was ankle edema demonstrated. About this time swelling of the salivary glands also appeared. The parotids were slightly enlarged and the submaxillary glands markedly so. The orifices of the ducts were not inflamed and the patient had no fever. This swelling disappeared spontaneously after a few days. The blood pressure on admission was 118/88. At no time during the illness did it rise above 140/90. The patient's weight was recorded daily in order to detect hidden edema. It remained stationary during the first 10 days of illness and then gradually fell off until after 3 weeks he had lost a total of 20 pounds. (He then weighed 154 pounds.)

Some of the laboratory findings are shown in table 1. The serologic tests were negative. The cephalin-cholesterol flocculation test was negative on 10 October. On this date also the total protein was 8.2, albumin 5.3, globulin 2.9, icteric index 8, and direct van den Bergh zero. Because of the lack of facilities the carbon dioxide combining power was determined only once, when on the eighth day of illness, it was found to be 47. A concentration dilution test 5 weeks after the

TABLE 1.—*Laboratory findings*

October	6	7	8	9	10	11	12	13	14	15	16	17	18
Day of illness	2	3	4	5	6	7	8	9	10	11	12	13	14
Nonprotein nitrogen (mg. per 100 cc.)	31	31	120	145	100	108	96	100	96	99	95	95	99
Plasma chlorides (mg. per 100 cc.)..	.....	.....	.....	.....	346	462	528	495	462	495	501	495	428
Erythrocyte count (millions).....	5	.....	.....	4.7	.....	4.5	.....	4.9	.....	5.0	4.9	4.9	4.9
Leukocyte count (thousands).....	14	.....	.....	11.0	.....	15.6	16.2	10.2	.....	17.2	13.6	18.2	13.2
Urine:													
Specific gravity.....	.....	1.021	1.020	.....	.....	1.010	1.008	1.008	1.007	1.005	1.006	1.008	1.007
Albumin.....	.....	++++	+++	+++	.....	++	++	+	+	trace	trace	+	+
Erythrocytes per highpower field	.....	6-8	6-8	6-8	.....	occ*	4-6	occ*	occ*	0	0	0	0
Leukocytes per highpower field	.....	occ*	occ*	2-3	.....	4-6	occ*	occ*	occ*	occ*	occ*	occ*	occ*
Hyaline and granular casts.....	.....	0	0	.....	.....	+++	+++	0	++	++	0	rare	0

October	19	20	21	22	23	24	25	26	27	28	29	30
Day of illness	15	16	17	18	19	20	21	22	23	24	25	26
Nonprotein nitrogen (mg. per 100 cc.).....	99	.....	110	80	66	.....	70	.....	39	.....	.....	25
Plasma chlorides (mg. per 100 cc.).....	495	.....	545	520	577	.....	561	.....	653	.....	.....	610
Erythrocyte count (millions).....	5.0	4.4	4.3	.....	4.6	.....	4.5	4.6	.....	.....	.....	4.7
Leukocyte count (thousands).....	16.8	14.0	14.0	.....	14.1	.....	14.2	7.2	.....	.....	.....	10.6
Urine:												
Specific gravity.....	1.007	1.007	1.016	1.016	1.007	1.010	1.010	1.008	1.010	1.010	.....	1.007
Albumin.....	trace	trace	0	0	+	0	0	0	trace	0	.....	0
Erythrocytes per highpower field.....	0	0	0	rare	0	0	0	0	0	0	.....	0
Leukocytes per highpower field.....	occ*	occ*	0	occ*	rare	occ*	occ*	occ*	occ*	0	.....	0
Hyaline and granular casts.....	0	0	0	0	0	0	0	0	0	0	.....	0

*occ = occasional

onset of illness produced a specific gravity ranging from 1.003 to 1.015, indicating continued impairment of tubular function. The phenolsulfonphthalein test was normal at the time. Electrocardiograms taken during the oliguric phase of the illness revealed no evidences of hyperpotassemia.

Treatment.—An attempt to limit the total fluid intake to 1,000 cc. plus the output was made as shown in figure 1. Only 21 grams of sodium chloride was administered intravenously during the oliguric

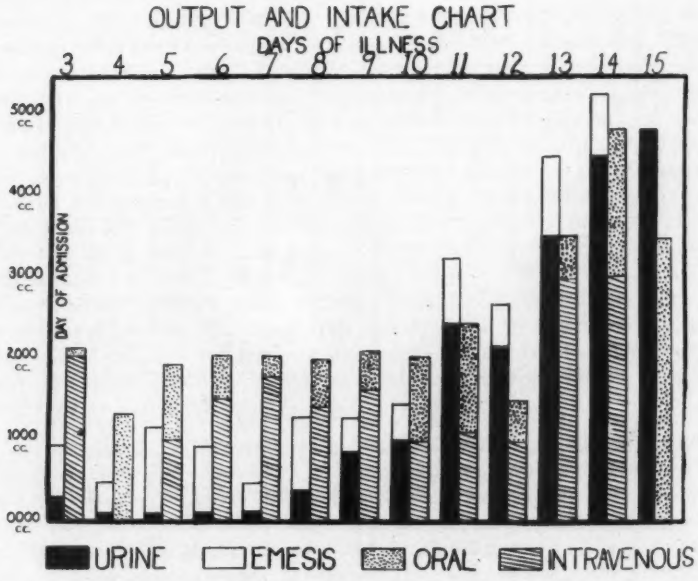

Figure 1.

phase of the illness. The first 9 grams of sodium chloride was administered because of dehydration caused by vomiting. The second and third administrations were for the correction of presumed blood sodium deficiency as evidenced by low blood chlorides. The fourth dose, given intravenously, was to correct an episode of hyperpnea, presumed to have been on the basis of acidosis. Sodium chloride intravenously was administered afterwards during the first days of excessive diuresis when the patient was still vomiting.

Dextrose, in 5 to 50 percent solution comprised the remainder of parenteral fluids. Parenteral vitamins in generous amounts and 1 cc. of liver extract were given daily throughout treatment. Penicillin intramuscularly and aureomycin rectally were given to combat the bron-

chitis which was present on admission and as prophylaxis against intercurrent infection. Seconal suppositories were administered for sedation. The patient was put on a rice diet (Kempner) in addition to other carbohydrate foods. Orange juice, because of its potassium content (even though low), was avoided. He did not tolerate solids or liquids very well until after diuresis had begun. Eight weeks after the onset of illness, the patient was clinically well and had regained the 20 pounds he lost during the first 3 weeks of his illness.

SUMMARY

A patient with lower nephron nephrosis following the inhalation of carbon tetrachloride fumes was treated conservatively and survived. An unusual feature of this case was the kidney enlargement as seen by roentgenograms. For the best results in carbon tetrachloride nephrosis, one should bear in mind that the renal tubules return to function in about 11 days and the mortality of the disease is largely caused by (1) congestive heart failure arising from overtreatment and (2) hyperpotassemia.

Because of the patient's lack of insight concerning the relation of carbon tetrachloride to the possible cause of his illness it is important to probe the history carefully.

A Successful Embolectomy for a Saddle Embolus of the Abdominal Aorta

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Edward V. Denneen, *Captain, MC, U. S. N. R.* (2)

A SADDLE embolus of the bifurcation of the aorta is a dramatic vascular accident which a general surgeon might be called on to treat. The lower extremities do not withstand an oxygen lack as well as the upper extremities where collateral circulation is more abundant. Acute anoxia caused by the sudden lodgement of an embolus at the bifurcation of the aorta rapidly produces a necrotizing reaction in the endothelial lining of the blood vessels, vasomotor spasm, intravascular clotting, tissue acidosis, necrosis, and gangrene. Some tissues of the body withstand anoxia for longer periods than other tissues. The brain can withstand an oxygen lack for not more than 4 or 5 minutes and recover; the kidneys, 4 to 6 hours; and the lower extremities, 8 to 12 hours. Time, therefore is an important factor in the management of a saddle embolus. The earlier an embolectomy is performed, the greater is the chance of a successful result. With each succeeding hour that the operation is delayed, the effects of anoxia and vasoconstriction are more pronounced and even though gangrene may not occur and an embolectomy be successful in saving the life of the patient, the resultant muscular fibrosis, atrophy, impaired circulation, and trophic skin changes are disabling late sequelas.

Virchow (3) first described arterial embolism. Labey (4) reported the first successful embolectomy for an embolus of the femoral artery.

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(3) Virchow, R.: Über die akute Entzündung der Arterien. Virchows Arch. f. path. Anat. 1: 272-378, 1847.

(4) Labey: Cited by Mosny, M., and Dumont, N. J.: Embolie fémorale au cours d'un rétrécissement mitral pur: Artériotomie guérison. Bull. Acad. de méd. 66: 358-361, 1911.

Keeley (5) in reporting a successful case, found 22 previously reported cases in which a saddle embolus at the bifurcation of the aorta was successfully removed.

TABLE 1.—*Sites of lodgement of emboli affecting the limbs (1)*

Site	Massachusetts General Hospital	Cases reported by Key (2) (3)	Cases reported by Petitpierre (4)	Cases reported by Danzis (5)
Subclavian artery	0	0	1 (0.7%)	2 (1.5%)
Axillary artery	9 (8.2%)	45 (11.8%)	10 (7.7%)	7 (5.4%)
Brachial artery	15 (13.6%)		10 (7.7%)	19 (14.7%)
Radial and ulna arteries	0	1 (0.3%)	2 (1.4%)	1 (0.7%)
Aorta	15 (13.6%)	17 (4.5%)	12 (9.3%)	11 (8.5%)
Iliac artery	14 (12.7%)	66 (17.2%)	26 (20.1%)	23 (17.8%)
Femoral artery	40 (36.6%)	208 (54.4%)	57 (44.5%)	52 (40.3%)
Popliteal artery	15 (13.6%)	43 (11.3%)	10 (7.7%)	12 (9.2%)
Posterior tibial artery	2 (1.8%)	2 (0.5%)	1 (0.7%)	2 (1.5%)
Total	110	382	129	129

(1) Warren, R., and Linton, R. R.: Treatment of arterial embolism. New England J. Med. 238: 421-429, Mar. 25, 1948.

(2) Key, E.: Über Embolectomi als Behandlungsmethode bei embolischen Zirculationsstörungen der Extremitäten. Acta chir. Scandinav. 54: 339-416, Jan. 1922.

(3) Key, E.: Embolectomy in treatment of circulatory disturbances in extremities. Surg., Gynec. & Obst. 36: 309-316, Mar. 23, 1923.

(4) Petitpierre, M.: Über Embolektomie der Extremitätenarterien. (Eine Zusammenstellung und ein Beitrag von 12 Fällen.) Deutsche Ztschr. f. chir. 210: 184-238, 1928.

(5) Danzis, M.: Arterial embolectomy. Ann. Surg. 98: 249-272, Aug. 1933; and 422-437, Sept. 1933.

The origin of the embolus, in most cases, is intracardiac from thrombi resulting from infarction and auricular fibrillation caused by rheumatic heart disease and arteriosclerotic and hypertensive heart disease; emboli also originate from thrombosed pulmonary veins, from atheromatous plaques in the aorta, and from aortic aneurysms. The most common site of lodgement of an embolus is where large arterial vessels divide into their major branches such as the bifurcation of the abdominal aorta, the bifurcation of the common iliac artery, the division of the common femoral artery into the deep and superficial femoral arteries, the division of the popliteal artery into the anterior and posterior tibial arteries, and the division of the brachial and axillary arteries. In a study by Warren and Linton (6) of their experience with 98 patients who had 172 arterial emboli during the period from 1937 to 1946, the limbs were affected in the cases of 110 of these emboli. Warren and Linton compare the distribution of the sites of lodgement of these 110 emboli in their series with those in three other series as shown in table 1.

(5) Keeley, J. L.: Saddle embolus of aorta; report of successful embolectomy. Ann. Surg. 128: 257-265, Aug. 1948.

(6) Warren, R., and Linton, R. R.: Treatment of arterial embolism. New England J Med. 238: 421-429, Mar. 25, 1948.

Embolism of the bifurcation of the aorta has an acute onset in about 90 percent of the cases. The pain is agonizing; it is located in the lower abdomen and radiates down both lower extremities. The femoral pulsations are absent but the aortic pulsation proximal to the site of embolus is generally forceful. The patient is in shock and has a motor and sensory loss in his lower extremities, which are cold and pallid. In about 10 percent of these cases the onset is slower, and in these the patient complains of a sensation of "pins and needles," in the lower extremities, merging into pain, which becomes more severe with each succeeding hour. The subsequent signs and symptoms depend on the size of the embolus, its propagation, and the extent of distal arterial thrombosis.

In this article a successful removal of a saddle embolus is reported.

CASE REPORT

A 56-year-old man was admitted to this hospital in December 1948. His first previous admission had been in December 1947, at which time he complained of nervousness, insomnia, and weight loss. Physical examination showed moderate bilateral exophthalmos, a diffuse moderately enlarged thyroid gland with a bruit, auricular fibrillation, and 1 plus ankle edema. The basal metabolic rate (BMR) was plus 38. He improved following the administration of digitoxin, propylthiouracil, and barbiturates. The BMR came down to plus 22, and he was discharged to the outpatient clinic for follow-up prior to a thyroidectomy for hyperthyroidism. He was readmitted in January, August, and November 1948 for recurrent cerebrovascular accidents of an embolic nature. His BMR varied from plus 16 to plus 22. His auricular fibrillation persisted and an electrocardiogram showed evidence of a chronic myocarditis on an arteriosclerotic basis. At the time of his admission in December 1948, he was mentally confused and had a left-sided hemiplegia.

In addition to a bilateral exophthalmos and a diffusely enlarged thyroid over which a bruit was heard, the patient had signs of left cardiac hypertrophy, an apical thrill and systolic murmur, a grossly irregular pulse, and a blood pressure of 160/90. Neurologic examination revealed a right-sided facial weakness, protrusion of the tongue to the left, and a left-sided hemiplegia with spasticity. A diagnosis of a cerebrovascular embolism on the basis of auricular fibrillation was made. In the 2 weeks following admission the patient became rational, the signs of his hemiplegia became minimal, and he became ambulatory.

On 29 December while lying in his bed, he experienced a sudden agonizing pain in the lower abdomen which radiated to both thighs and legs. On examination both lower extremities were cold and pallid. The femoral and popliteal pulsations could not be felt. Oscillometric readings were negative. He complained of coldness of both lower extremities with a loss of sensation and motion. A diagnosis of a saddle embolus of the bifurcation of the aorta was made.

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Three hours after the onset of symptoms, under nitrous oxide-pentothal anesthesia, the abdomen was opened through a left lower rectus muscle-splitting incision. With the patient in moderate Trendelenberg position, the peritoneum and adventitia covering the aorta and iliac vessels were incised longitudinally from the level of the inferior mesenteric artery to below the bifurcation of the aorta, a distance of about 3.5 cm. No pulsation was evident from 2.5 cm. proximal to the length of both common iliac arteries, although the pulsations proximal to this segment were greatly exaggerated. The terminal 2.5 cm. of the abdominal aorta and both common iliac arteries were blue-gray and firm to palpation. The inferior vena cava and common iliac veins were separated from the abdominal aorta and common iliac arteries, and the terminal 4 cm. of the aorta and the common iliac arteries were mobilized for a distance of 3 cm.

Rubber dams (1 by 6 inches) were placed around the abdominal aorta, proximal to the bifurcation, and also distally around each common iliac artery. The ends of each rubber dam were clamped with hemostats and and were used for traction and to control bleeding. While slight anterior traction was maintained on the rubber dam placed around the aorta, a 1-inch longitudinal incision was made in the aorta over the site of the embolus, and proximal to the bifurcation. A firm grape jelly-colored clot was manually expressed from the proximal aorta. No free bleeding was encountered. Suction was then applied, using an L-shaped glass tube attached to a low-pressure suction pump, and a clot was sucked from the aorta proximally. The spurting of blood which followed was controlled by anterior traction on the aorta. In a similar manner, a 2 by 0.5 cm. Y-shaped clot was milked and sucked out of the common iliac arteries.

Before free bleeding was obtained from the left common iliac artery, it was necessary to use both suction and the injection of normal saline solution. Free bleeding from the common iliac arteries was controlled by anterior traction on the rubber dam placed around the aorta and on those around each common iliac artery. The aorta was sutured with interrupted sutures of No. 00000 silk, using an atraumatic needle. The adventitia was closed with interrupted Lembert's sutures. Oxycel was placed over the suture line and the peritoneum and the abdominal wall were closed. On completion, both femoral and popliteal arteries were pulsating strongly. The patient was given 50 mg. of heparin intravenously. During the operation, he received 900 cc. of whole blood. Postoperatively, he was given continuous spinal analgesia through a Huber needle, using 75 mg. of procaine repeated every 4 hours for 48 hours. Both lower extremities were wrapped in stockinet and a heat cradle was placed over the bed, maintaining a temperature between 75° and 80° F. Seventy-five milligrams of heparin were given intravenously every 6 hours for 8 doses. On the day of the operation the patient received 300 mg. of dicumarol, followed by 200 mg. on the first postoperative day. The daily dose of dicumarol thereafter was adjusted to the daily prothrombin time. Both lower extremities remained warm and normal in color. The popliteal, dorsalis pedis, and posterior tibial pulsations returned on both sides.

Three days after operation the patient was up in a chair. His recovery was uneventful and he was discharged on 21 April 1949 with excellent circulation in the extremities.

DISCUSSION

A transabdominal approach to the bifurcation of the abdominal aorta provided adequate exposure of the site of the embolus, and allowed direct vision and gentle handling of tissues in mobilizing the aorta and common iliac vessels so that anterior traction on the rubber dams placed around the arteries satisfactorily controlled bleeding. This approach also has the advantage of allowing the operator to perform a bilateral sympathectomy, with very little time added to the operation. The bilateral removal of the third lumbar ganglion, which is easily exposed in the operative field, is sufficient. This further provides a more satisfactory sympathetic block to the lower extremities. Martin et al. *(7)* however have stated that a sympathectomy in arterial occlusion may have an untoward result because of the lessened blood flow caused by a lowered blood pressure immediately following operation.

A retrograde approach requires bilateral exposure of the femoral arteries. Removal of the large adherent clot found in this patient might have been more difficult by the retrograde method. The use of a corkscrew or similar special instrument to dislodge the clot may traumatize the intima with subsequent thrombus formation. The retroperitoneal approach with dissection of the peritoneum upward to expose the retroperitoneal aorta and its bifurcation is advocated by many surgeons.

We followed the technic of Linton *(8)* which consists of (1) a direct peritoneal approach with adequate exposure; (2) gentle handling of tissues; (3) the occlusion of both common iliac arteries by traction before the aorta is opened in order to prevent the passage of clots distally as the clot is milked out of the aorta; (4) avoidance of injury to the aortic intima by not using clamps or twisted tourniquets; and (5) a bloodless field which permits accurate placing of everting sutures.

During convalescence, and thereafter, the patient received 600 mg. of dicumarol weekly, in doses of 100 mg. daily for 6 days. The prothrombin time was determined weekly. In 4 months of this treatment, the patient had no recurrence of embolism.

(7) Martin, W. B.; Laufman, H.; and Tuell, S. W.: Rationale of therapy in acute vascular occlusions based upon micrometric observations. Ann. Surg. 129: 476-493, Apr. 1949.

(8) Linton, R. R.: Arterial embolism; simplified technique for removal of saddle embolus at bifurcation of aorta with report of successful case. Surg., Gynec. & Obst. 80: 509-516, May 1945.

Exposure (Open) Treatment of Burns[1]

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OUR interest in thermal burn injury was stimulated some time ago by the release of information revealing the overwhelming incidence of thermal burns in atomic warfare. Several thousands of burn casualties must be anticipated following explosion of an atomic bomb over any large city. With the possibility of such a catastrophe, simplification of methods of treatment becomes necessary in the interest of economy of personnel and material. Anyone who has experienced the sudden influx of even six badly burned patients in a hospital can well appreciate the drain on supplies alone for the treatment of these patients with the currently standard pressure dressing method. With these considerations in mind, we began to study the effectiveness and practicability of the exposure principle of burn therapy which had been reintroduced in the British Isles by Wallace (4) about 2 years ago. The open treatment of burns was used in the United States at least 50 years ago and was discarded after the introduction of paraffin wax and ambrine treatment of burns in 1914 (5).

PRINCIPLES OF TREATMENT

As in all technics of burn management, prevention and treatment of shock takes precedence over local therapy. Susceptibility to shock bears relationship to extent of injury. We have found it practical to

(1) Presented at a meeting of the Royal Society of Medicine, London, 9 February 1951.

(2) Surgical Research Unit and Surgical Service, Brook Army Hospital, Fort Sam Houston, Tex.

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(4) Wallace, A. B.: Treatment of burns. Ann. Roy. Coll. Surgeons England 5: 283-300, Nov. 1949.

(5) Blocker, T. G.; Blocker, V.; and Pulaski, E. J.: Open air method of burn therapy; history and present-day application. In press.

modify the Berkow scale for the purpose of making a quick estimate of total burn surface (fig. 1). The body is divided into sectors, all of which, except the perineum, represent 9 percent of the body surface or multiples thereof, as follows (6): head and neck, 9 percent; each upper

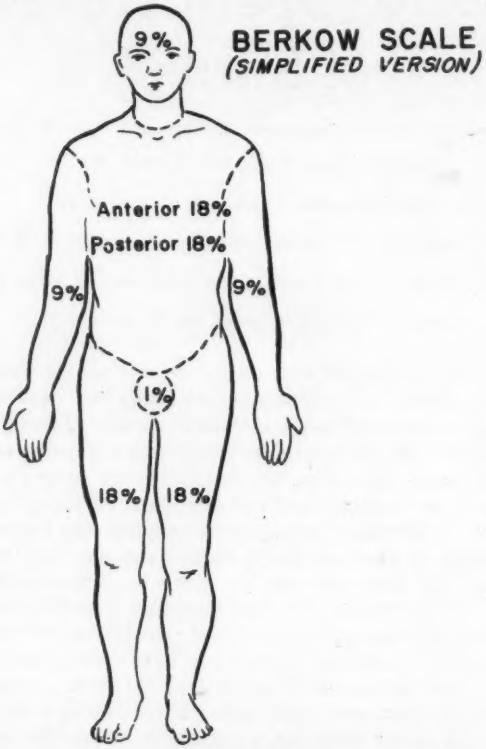

Figure 1.—Rule of nines for estimation of extent of body surface area burned.

extremity, 9 percent; each lower extremity, 18 percent; anterior and posterior trunk, 18 percent each; perineum, 1 percent. The extent of body burn determines blood and electrolyte solution requirements, which are given according to formulations designed to maintain a urinary output of from 40 to 60 cc. per hour (6) (7). Cannulation of a vein for fluid replacement is desirable. In order to obtain accurate measurements of

(6) Cope, O., and Moore, F. D.: Redistribution of body water and fluid therapy of burned patient. Ann. Surg. 126: 1010-1045, Dec. 1947.

(7) Purnell, O. J., and Evans, E. I.: Fluid and electrolyte requirements in burns. Presented at Symposium on Burns, National Research Council, Washington, D. C., 2-4 November 1950.

the urinary output, we prefer to catheterize any patient with a burn of more than 25 percent of the body surface.

Next to maintaining the patient's fluid and electrolyte balance, prevention of infection is of the utmost importance because the threat of infection is present until the wound has healed. The pathways of infection in burns include the burned tissues and surrounding intact skin as well as the unprotected hands and respiratory tracts of patient and attendants. Infection is the important factor in converting partial burns to full-thickness burns. The purpose of cover over a burn surface is to block exogenous pathways of infection. The purpose of exposure is to prevent contamination from becoming wound suppuration. It is based on the principle that bacteria cannot tolerate drying and sunlight. Furthermore, pabulum for bacterial growth is reduced to a minimum by meticulous excision of all loose or detached epithelium and gentle cleansing of the burn surface. The natural antibacterial properties of exuding plasma, enhanced by antibiotics, assist in eliminating residual microorganisms. In patients receiving penicillin intramuscularly we have measured up to 1 unit of penicillin per ml. of exuding plasma. Topley and associates *(8)* have demonstrated aureomycin in excess of 1 microgram in burn exudates of patients treated with 250 mg. of aureomycin by mouth every 6 hours. The drug levels achieved are bacteriostatic for most hemolytic streptococci and hemolytic coagulase-positive micrococci which commonly predominate the bacterial flora of recent burns.

Coagulation and drying of the exudate over a period of from 24 to 72 hours results in the formation of a tough eschar, which in turn protects the burns from further contamination. Rest or avoidance of movement, as well as other trauma, and elevation of extremities to minimize edema are factors of influence in promoting rapid formation of this eschar. Absorptive dressings achieve the same ends in a different way.

THE EXPOSURE (OPEN) TREATMENT OF BURNS

The purpose of this article is to report our experience in a clinical trial of the exposure method in 131 patients (table 1), with particular emphasis on (1) types of patients suitable for exposure treatment, (2) problems of application of the method, and (3) its advantages and disadvantages. Sixty-five were hospitalized in Brooke Army Hospital and were seen mostly within from 1 to 24 hours after injury. The other 66 were injured in Korea and were seen at Tokyo Army Hospital on an average of 4½ to 7 days after injury. The management was the same in both groups. Clothing or dressings are removed, preferably using aseptic precautions, as soon as the patient is seen, and gross dirt is washed off the injured area with large quantities of warm water with the addition of some detergent such as hexachlorophene, or with a bland white soap which is also satisfactory. All blisters are opened and all detached epithelium is removed. Cleansing and débridement are

(8) Topley, E.; Lowbury, E. J. L.; and Hurst, L.: Bacteriological control of aureomycin therapy. Lancet 1: 87, 1951.

performed with a minimum of trauma to the surviving epithelium. If the patient has been burned recently, morphine given intravenously provides sufficient analgesia. If the burn is older, light general anesthesia is usually necessary. Three thousand units of tetanus antitoxin and 600,000 units of aqueous procaine penicillin G are given intramuscularly on admission. The same dose of penicillin is given daily for an additional 4 days and thereafter only for a specific indication. After débridement, the patient is placed in a bed in the position which best exposes the affected side. Sterile sheets are not necessary.

TABLE 1.—*Details of exposure treatment of 131 burn patients*

	Brooke Army Hospital (65 patients)	Tokyo Army Hospital (66 patients)
Patients with full-thickness burn		
Body area burned:		
Less than 10%	10	16
10-20%	9	9
Over 20%	5	3
Day of exposure*	1	7.3
Day of graft*	24	19
Deaths**	4	0
Patients with partial-thickness burn		
Body area burned:		
Less than 10%	31	28
10-20%	6	7
Over 20%	4	3
Day of exposure*	1	4.9
Day of healing*	13.5	14.3

*Average

**One death—accidental burn following syncope due to exsanguinating hemorrhage from peptic ulcer. Three deaths—85%, 60%, and 57% full-thickness burns.

If the patient is in shock on arrival, he is placed between clean sheets and treated intensively for shock. Débridement is postponed until the general condition has improved. The success of the method depends largely on how effectively complete exposure, relative immobilization, and elevation can be achieved.

Extremities.—Elevation of the extremities prevents additional edema by aiding the return of venous blood to the heart. Conversion of a partial-thickness burn to a full-thickness burn is thereby avoided. Burns of the configuration which provide an uninjured area on which to rest for weight bearing present no special problem. If the feet and ankles are not involved, the leg and thigh can be elevated by resting the ankles on several pillows. In this manner, circumferential burns of the lower extremity up to midthigh can be treated satisfactorily by exposure. In burns involving the hand we believe that most patients can be encouraged to lie in bed with the elbows flexed and hands elevated. It is of paramount importance that the wrists be kept in a position of function with the metacarpophalangeal joints in flexion. It is highly

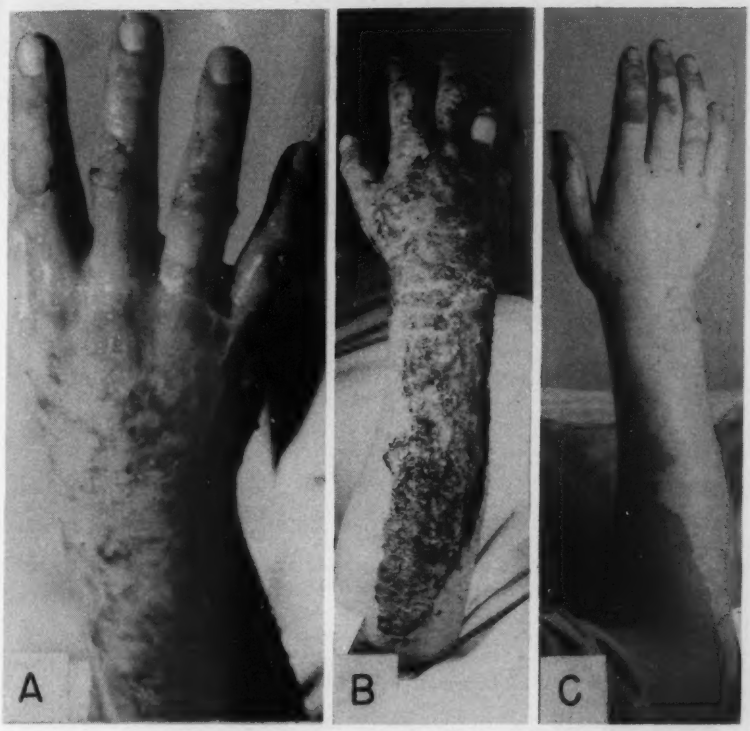

Figure 2.—(A) *Partial-thickness burn immediately after injury.* (B) *Appearance of arm and hand 7 days later. A dry plasma crust protects the injured surface.* (C) *Appearance at time of discharge 14 days after injury.*

desirable to have the crusts form with the hand in this position. Figure 2 shows a typical result. For circumferential burns involving the upper arm and upper thigh, exposure in our experience has not been altogether satisfactory, particularly when other regions of the body also were burned.

The trunk.—Burns involving only one side of the trunk are managed satisfactorily by the exposure method, but circumferential burns pose a real problem. We have treated some of these by placing the patient on one side until complete crust formation has taken place. The patient was then turned and a crust allowed to form on the other side. This regimen leaves much to be desired, particularly if the upper extremities are also burned, because the crust frequently cracks and thereby invites infection. Problems inherent in closed methods of treatment of the buttocks area are largely eliminated by exposure and our results have been good. Figures 3, 4, and 5 show typical result.

Figure 3.—Partial-thickness burn caused by lifting lid off can of boiling water. Appearance following cleansing and exposure 6 days after injury.

Figure 4.—Same patient as figure 3 on fifth day of exposure. Crust well formed.

Figure 5.—Same patient as figure 3 at time of discharge 25 days after admission (19 days after starting exposure treatment).

The head.—In general, this method of treating burns of the face has given gratifying results. If the eyelids are involved, contracture is a serious threat. Irritation of the cornea caused by inability to effect complete closure of the lids, corneal ulcers, and, finally, ectropion may occur. Tarsorrhaphy performed early will frequently prevent these complications and, in the deep burn, will provide optimal conditions for early grafting and correction of the deformity. With burns of the neck, hyperextension and relative immobilization are important for uncomplicated crust formation.

In the uncomplicated case, a crust forms in from 24 to 72 hours. A warm environment will delay the formation of a crust, and cold appears to hasten it. A good crust is dry and completely painless. Spontaneous desquamation of the crust over partial-thickness burns generally occurs between the eighth and sixteenth days. The average healing time for partial-thickness burns is 14 days after beginning exposure treatment. In mixed partial- and full- thickness burns, the crust tends to remain firmly adherent in the full-thickness areas. We have usually delayed excision of crusts until the twenty-first day after burning and never later than the twenty-fifth day.

DISCUSSION

Partial-thickness burns up to 30 percent of body surface and involving predominantly one side of the body are particularly suited for treatment by exposure, as are burns of the head and buttocks. If the regimen

as outlined above is adhered to, these types of burns heal with a minimum of discomfort to the patient and minimal nursing assistance. Loss of weight and debilitation are less frequently observed. Particularly striking is the observation that suppuration is uncommon and that the characteristic odor associated with infection in burns becomes hardly detectable. In consequence, conversion by infection to full-thickness skin loss rarely occurs. The opportunity afforded by daily critical inspection of the burn crust forewarns against threat of infection in cracks, with the result that suppuration, if it occurs, can be prevented from becoming diffuse. On the basis of our experience, particularly in Tokyo Army Hospital, we now regard 1 week after injury as the upper limit of applicability of the exposure method. It cannot be overemphasized that a granulating wound is unsuitable for treatment by exposure.

Several aspects of exposure treatment warrant comment. Care and ingenuity are required to obtain free exposure to air of burns of complicated distribution. Cooperation of the patient is essential. An uncooperative patient, adult or child, will frequently defeat the principle of treatment by undue movement, soaking of the crust by incontinence, and the like. Patients are particularly susceptible to draft and often complain of chilliness the first day or two after exposure. Curiosity is another problem, and it affects physicians and nurses as well as patients and their visitors. It is a great temptation to become impatient with the natural rate of separation and to lift off the eschar. When this is done, newly laid down epithelium is pulled off with it, bleeding ensues, and contamination, which is often followed by infection, is the result. The temptation is less if, as separation occurs, curled up, freed crusts are trimmed.

In our hands circumferential burns of the trunk have shown evidence of infection because either the crust became cracked or it failed to form completely. To date we have no solution to this problem. In a few instances contraction of the crust over full-thickness burns of the extremities has given rise to ischemic pain. Crusts over the chest may at times interfere mechanically with respiration and require incision.

Finally, results obtained with the exposure method, as with any other method, bear a direct relationship to the thoroughness with which details of treatment are carried out.

CONCLUSIONS

Although the experience with the exposure treatment of burns at Brooke Army Hospital and Tokyo Army Hospital has been generally satisfactory, it is not possible at this time to assess fully the value of the method for all types of burns under all conditions. This method, however, does appear to be highly satisfactory for burns confined to one side of the body and for burns involving the head, neck, or perineum.

Mandibular Ostectomy

A Case Report

Richard J. Burch, *Lieutenant Colonel, U. S. A. F. (DC)*

A 19-YEAR-OLD soldier came to the dental service of Percy Jones General Hospital in December 1949 seeking treatment for severe malocclusion and congenital prognathism (figs. 1 and 2). In 1946 he had become aware of inability to masticate food and of overdevelopment of the mandible. In the year preceding his examination in the clinic he had lost about 25 pounds in weight. No other members of his immediate family had a similar condition.

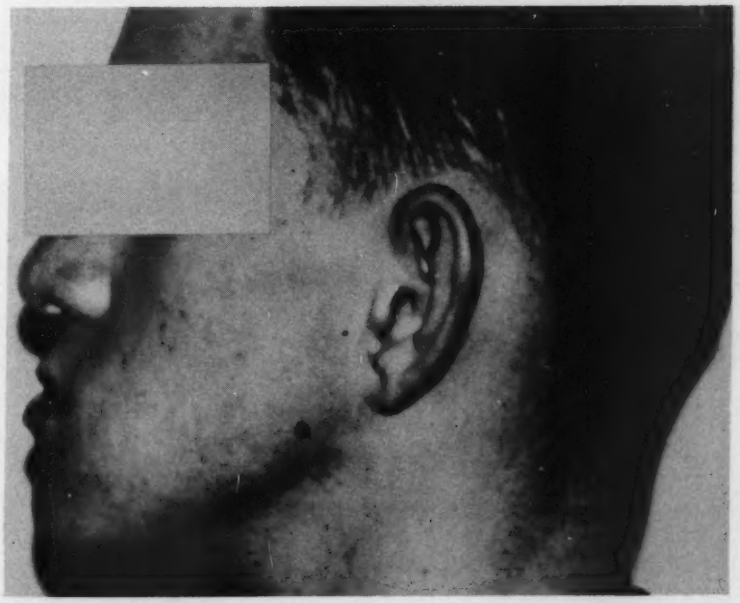

Figure 1.—Preoperative appearance of patient.

Examination.—The oral tissues were normal in color and tone. The teeth were in fairly good position in the arches but there was no functional occlusion (fig. 3). The tips of the upper right and left cuspids

Figure 2.—Preoperative roentgenogram.

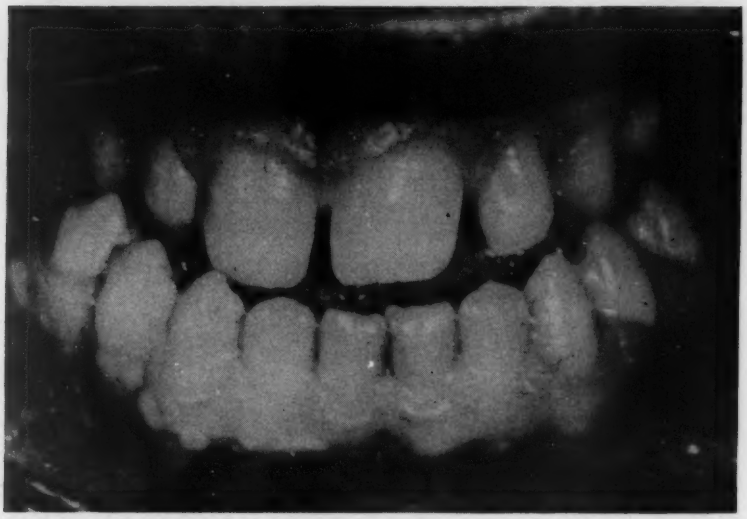

Figure 3.

were in point contact with the lower teeth in the resting position. There were no teeth distal to the left second mandibular bicuspid. General physical findings were essentially normal. Full-mouth, lateral plates of the hard and soft tissues, postero-anterior roentgenograms, and maxillary and mandibular study models were made.

Preoperative treatment.—In preparation for a bilateral mandibular ostectomy, upper and lower models were duplicated and mounted on the articulator. The mandibular model was sectioned and by trial position it was determined that for optimal occlusion 1 cm. should be removed

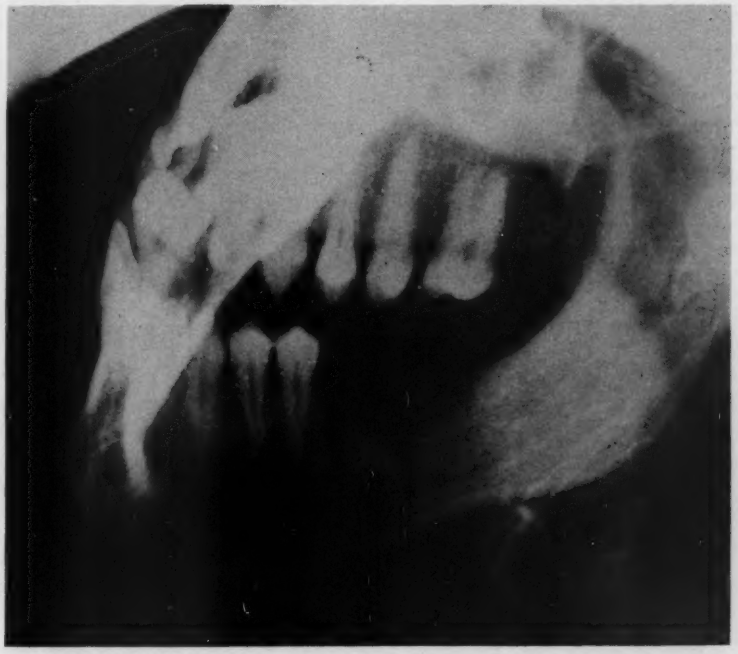

Figure 4.

from the left side immediately distal to the second bicuspid and 0.8 cm. from the right side at the site of the first molar.

Operation.—The patient was admitted to the oral surgery service of the hospital on 3 February 1950 and the intraoral procedure was performed on 4 February under premedication, procaine block and infiltration anesthesia. On the left the soft tissue was elevated and the lingual and cortical plates cut with the surgical bur well down the mandible at a predetermined point (fig. 4). The right mandibular first molar was removed and the cortical cuts were repeated through the socket area (fig. 5). The soft tissue was returned to position and sutured. The patient was given penicillin for 1 week postoperatively.

Figure 5.

Five weeks later a cast labiolingual appliance was inserted on the maxillary teeth and fixed with interproximal pins. New impressions were then taken and models were made and mounted on the articulator. The lower model was sectioned, repositioned, and restored with stone. The left side was relieved to allow for the excess of soft tissue which would result from the second operation. The repositioned lower model was then waxed for the splint in open bite position and processed in acrylic. A contoured arch bar was fixed to the lower anterior teeth by direct wiring and a gold crown with buccal lug was cemented on the right second mandibular molar.

On 14 March the extraoral procedure was completed under gas-oxygen-ether nasal intratracheal anesthesia. A bilateral mandibular block with procaine and epinephrine was given to aid in hemostasis prior to the induction of anesthesia. The inferior border of the right mandible was exposed through a 3.5 cm. incision 1 cm. below the inferior margin and the periosteum elevated to expose the cuts in the cortical plate. The section of the cortical plate was completed with a surgical bur. Holes for direct wiring were made through the anterior and posterior segments 0.5 cm. from the fracture lines with a bibeveled bur. The buccal cortical plate was then sectioned over the nerve canal and the lower bone section removed after completing the fracture manually with an osteotome. The upper portion of the bone section was then removed without damage to the neuro-arterial sheath. The sheath was not centric in position but was found lying directly on the lingual

cortical plate. Because of the unusual density of the cancellous structure, recesses in each segment to accommodate the excess length of the neuro-arterial sheath were cut with a mallet and chisel. The bone segments were then approximated with a No. 0.02 stainless steel wire and the soft tissues closed without drains. The procedure was repeated on the left side. Dressings were applied and the oral splint was inserted with intermaxillary elastic traction.

Course.—During the operation the patient was given 500 cc. of whole blood followed by 500 cc. of 5 percent dextrose in water intravenously and was given 1,000 cc. of 5 percent dextrose in water intravenously after his return to the recovery ward. He was also given 100,000 units of penicillin every 3 hours, and codeine sulfate was used as needed to control mild postoperative pain. On the day following the operation 1,000 cc. of 5 percent dextrose in saline solution with 250 mg. of ascorbic acid and 250 mg. of thiamine added was given intravenously. Again on 17 March 1,000 cc. of 5 percent dextrose in saline solution with 250 mg. of ascorbic acid and 100 mg. of thiamine was given intravenously. The patient had a mild postoperative edema and required little sedation. By the third postoperative day he was taking ample quantities of a high caloric liquid diet. The results following removal of intermaxillary fixation and the splint are shown in figures 6, 7, and 8.

Figure 6.—Postoperative roentgenogram.

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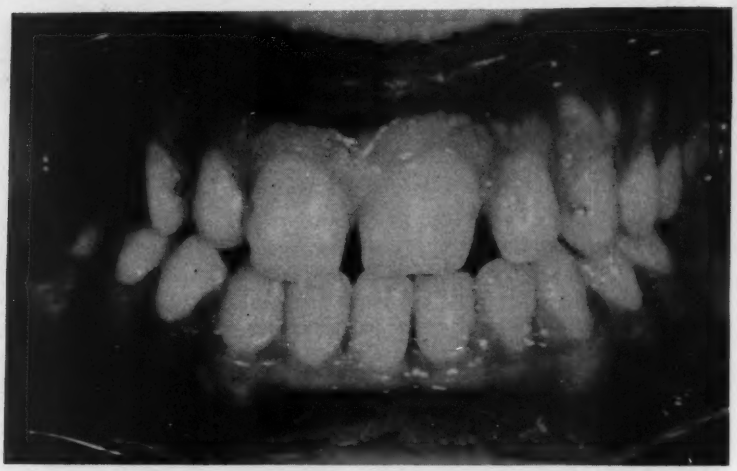

Figure 7.

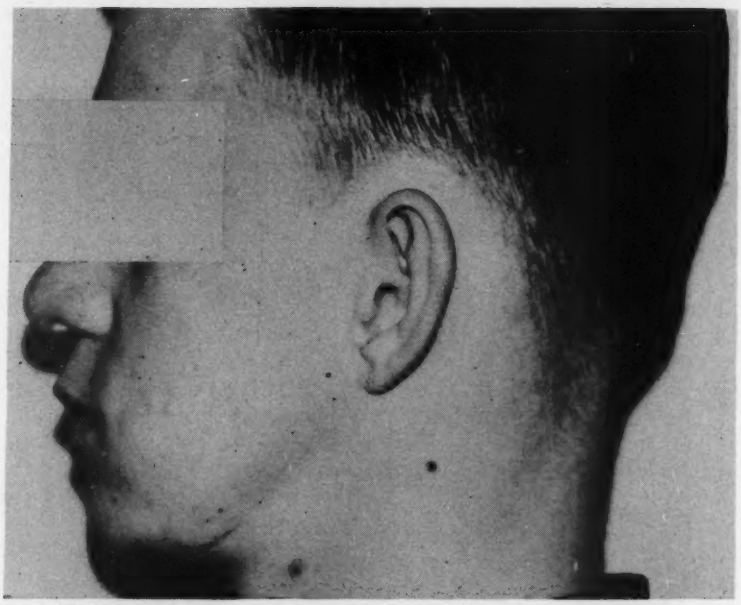

Figure 8.—Postoperative appearance of patient.

Comment.—This patient gained 6 pounds during the 9 weeks healing period, and the fibrous union was unusually strong for that length of time. His diet averaged 4,000 calories daily and was carefully supervised in both preparation and ingestion.

Duplication of Acrylic Dentures

Richard F. Tuma, *Commander, DC, U. S. N.* (1)

THERE are many laboratory procedures for the rebasing and duplication of acrylic dentures containing porcelain teeth. All of these procedures, with slight variations, are basically the same and each has its own undesirable features, such as: (1) the large percent of error in transferring the teeth from a plaster matrix to a finished waxed model; (2) the patched appearance of the denture, caused by the line of union of the materials; and (3) the difficulties encountered in cleaning the impression material from the denture base while in a flask to allow the curing of new material on the old denture base. Recently we have tried a different technic which has proved highly successful.

The procedure is as follows: Clean all the stain from the teeth of the old denture with a rag wheel and pumice. Remove all undercuts from the old denture. Using the denture as an impression tray, take an impression. Pour a model in the old denture and do not separate the denture from the model. Invest the denture and the model in a denture flask in the usual manner, using stone as the investment. Separate the flask in accordance with the usual procedure for the impression material. Trim the periphery of the cast as in preparation for processing any denture. All gross impression material should be removed from the old denture base with a knife or scraper. Place the half of the flask containing the old denture in a large inlay furnace and heat slowly at about 550° F. until the acrylic is thoroughly softened. Remove the flask from the furnace with tongs, then grasp the acrylic material with pliers and pull from the mold. An occasional tooth that pulls loose from the mold can be replaced when the flask has cooled. Allow the mold to cool and remove any impression material that has adhered to the stone. Paint the mold with any separating material and proceed as in packing a new denture.

This technic is speedy and greatly reduces the percent of error as compared to other methods of duplication. No equipment is needed other than that usually found in a dental prosthetic laboratory. The denture does not present a patched or repaired appearance.

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Military Preventive Medicine[1]

A Keystone of Military Strength

James Stevens Simmons, *Brigadier General, U. S. A. (Ret.)* (2)

IF I were starting my military career today, I should like someone to give me a clear picture of the objectives of the Medical Service of the Army and to indicate the main channels through which the Medical Service and all its personnel can work most profitably for the achievement of these objectives. I would want this type of orientation to help me in shaping my own philosophy and all my future actions as a military surgeon.

THE MISSION OF THE MEDICAL DEPARTMENT

Briefly stated, the responsibility of the Medical Service is to keep the soldier on his feet and fit to fight. This is a big order, and the achievement of this mission requires broad leadership, clear vision, careful planning, and aggressive action by a great variety of specialists. The major approaches to the accomplishment of this mission are clinical and preventive.

The clinical approach is to organize adequate personnel and facilities with which to salvage the sick and wounded and restore them to health. A modern army must provide effective first aid and rapid evacuation for the wounded. It must have modern facilities, adapted to combat conditions, so that the sick and wounded will receive the best possible medical care and hospitalization. This must be followed, when feasible, by modern rehabilitation to restore the soldier to a state of physical and mental fitness in the shortest possible time. To accomplish this important portion of the Medical Service's mission requires an enormous organization and large numbers of specialists in every aspect of curative surgery and curative medicine.

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(1) Presented before the class in Military Medicine at the Army Medical Service Graduate School, Army Medical Center, Washington, D. C., 21 February 1951.

(2) Dean, Harvard School of Public Health.

The preventive approach to the conservation of fighting manpower is the even greater obligation of the Medical Service to protect as many soldiers as possible against sickness or injury. This more constructive approach is made through the numerous activities now included under the term "military preventive medicine." From the viewpoint of military efficiency, it is more desirable to keep the well soldier well than to provide the expensive and complex facilities required to restore the sick soldier to health. For this reason, disease prevention should logically be the primary objective of the Medical Service.

It is therefore important that every member of the military establishment—not only the personnel of the Medical Service, but all members of the combat arms—should adopt the preventive attitude toward disease. Every soldier should keep in mind the basic truth that "an ounce of prevention is worth a pound of cure" and he should be familiar with the basic principles that can be applied for his protection against disease.

According to a newspaper announcement several weeks ago, an epidemic of typhus was raging among the Chinese troops in Korea. Such a report 10 years ago would have caused us much concern. Today there is no reason for alarm because we are armed with effective preventive measures developed in the last war with which American troops can be protected against this ancient scourge. We now have an effective typhus vaccine and an even more effective louse powder. This incident serves to point up the practical importance of military preventive medicine today. It also emphasizes the fact that this young specialty is not static but is vigorous, rapidly growing, and has infinite possibilities for further development; this is important because the nation now faces the most serious threat of its entire existence. We must immediately take steps to strengthen our total health defenses in order to conserve both fighting and working manpower.

Since 25 June 1950, the Armed Forces have been faced with the problem of maintaining the health of our troops fighting in Korea and at the same time planning for the prevention of disease among the large forces now being mobilized and trained to meet the threat of a third global war. The civil population is faced with the equally difficult problem of strengthening its program of preventive medicine and public health to conserve industrial manpower and to operate the expanding health departments required for civil defense. It is therefore important to take stock of the nation's total health facilities—both military and civilian—in order to make sound plans for the present emergency.

MILITARY PREVENTIVE MEDICINE

The aim of preventive medicine is to prevent physical and mental disease. In civilian medical schools the term "preventive medicine" is commonly restricted to the prevention of disease in the individual; the term "public health" is applied to the prevention of disease and the

conservation of health in communities or other large aggregations of people, such as States or nations. "Military preventive medicine" applies to large groups of fighting men and therefore it is comparable to civilian public health. Since the beginning of history every intelligent military leader has been aware of the hazards of disease and has realized the need for some method which would protect his troops against sickness. This was true even of the barbarians who reluctantly abandoned their sick and wounded fighting men on the battlefield.

An early example of an attempt to do something about the American soldier's health is afforded by an order, issued by General Washington at Peekskill in the Revolutionary War, entitled: "Instructions for Soldiers in the Service of the United States Concerning Means of Preserving Health." At that time there was no knowledge concerning the transmission of infectious diseases and these instructions emphasized cleanliness, camp hygiene, and the disposal of feces. These activities are still important to good health, but we now know that they are not enough to prevent disease. Therefore, it is not surprising that General Washington's troops were decimated by numerous epidemics. Conditions were no better in the War of 1812, the Mexican War, or in the Civil War. The commanders and medical officers of those early days must have been deeply frustrated at their inability to control the diseases which have always accompanied war.

Development of basic knowledge.—In the period following the Civil War, the foundation for preventive medicine was laid. From 1860 to 1900 the medical discoveries of Pasteur, Koch, and Lister, and their associates and followers produced a great reservoir of specific knowledge about many of the micro-organisms which cause disease. It is fortunate that during that time a member of the Regular Army Medical Corps, George M. Sternberg, became interested in the potentialities of these new discoveries. Having served in the Civil War, and having seen the crippling effect of the military diseases of that period, he knew that they could not be controlled by any method available at that time. Excited by the promise of these new discoveries, he undertook pioneer studies in the newly emerging sciences of bacteriology and protozoology, and discovered the pneumococcus. He published the first American textbook on bacteriology in 1884, and he was later referred to by Robert Koch as the "father of American bacteriology."

Sternberg served as Surgeon General from 1893 to 1902 and during this period he initiated an extensive program of research in military preventive medicine. Following the bitter experience of our troops with typhoid, dysentery, and yellow fever during the Spanish-American War, he organized special Army research boards for the study of diseases in our newly acquired tropical possessions. His broad vision made possible the important researches of Major Walter Reed on yellow fever in Cuba—researches which influenced the later work of General Gorgas on sanitation in Panama. It led to Colonel Ashford's studies which

showed that malignant Puerto Rican anemia was caused by massive hookworm infestation. This was followed by the world-wide hookworm control program of the Rockefeller Foundation. It provided for the investigations of Colonel Strong on dysentery, plague, cholera, and other tropical diseases in Manila, the researches of Colonel Craig on malaria in the Philippines and elsewhere, and for the work of Colonel Siler and others on dengue. It undoubtedly influenced the later work by General Darnall who gave to the world improved methods for the chlorination of city water supplies, and the researches of General Russell who developed the triple typhoid vaccine which has been used successfully by the Armed Forces in two world wars. Sternberg's broad concept of the importance of preventive medicine influenced all of these contributions. It also stimulated other Army, Navy, and civilian workers to conduct researches along similar lines which have added much to the development of both military and civilian preventive medicine.

As evidence of General Sternberg's leading role in the country's medical and health activities of his time, it is noteworthy that he served as President of the American Medical Association and as President of the American Public Health Association. He was also a pioneer educator in the new field of military and civilian preventive medicine. When he became Surgeon General in 1893, one of his first acts was to organize the Army Medical School in Washington to provide facilities for research and for postgraduate education of medical officers with special emphasis on prevention. It was not until 16 years later (1909) that the first formal department of preventive medicine was established in any civilian medical school (Harvard) in this country.

MILITARY HEALTH IN THE TWENTIETH CENTURY

Since 1900 there has been a progressive improvement in military health which has paralleled closely the advances in civilian medicine and public health. During World War I both the Army and Navy had well organized programs of preventive medicine and their health records were much better than in previous wars. Typhoid, which had been a serious threat even as late as the Spanish-American War, was well controlled. The most important causes of sickness and death were pandemic influenza and other respiratory diseases. There was little exposure to tropical diseases.

In the 20 postwar years of peace, public health in this country made still further advances. Just before World War II the crude death rates for the United States had decreased from 17 per thousand in 1900 to about 10 per thousand in 1940. The expected life span at birth for an American citizen had increased from about 46 years to about 65 years. As usual, the peacetime health of our troops stationed in permanent posts in the United States was better than that of the average nonmilitary citizen. This is generally true because (1) the military forces are made up largely of vigorous young adults who have been carefully se-

lected; (2) the American military man's way of living, including his personal hygiene, diet, housing, and physical training is regulated; (3) he is immunized against smallpox, typhoid, and other infectious diseases to which he may be exposed; and (4) he lives in a carefully sanitated environment which is rigidly controlled by a well-organized Medical Service.

PREVENTIVE MEDICINE PROGRAM IN WORLD WAR II

The hardships imposed by field service and combat make it difficult to maintain this type of peacetime health protection under the conditions of war. Therefore when it appeared that the United States would be drawn into World War II, the Surgeon General of the Army began to plan the expansion of the Medical Service to meet the increased responsibility of mobilization and war. The situation was somewhat like that faced today, but in 1940 we were not so well prepared for war as we are now. Although at that time the total Medical Service of the Regular Army consisted of only a few thousand officers, by the end of the war it had expanded to more than 100,000 officers and several hundred thousand enlisted men—a medical force which was larger than the entire Regular Army prior to the war.

Convinced of the importance of disease prevention, to the accomplishment of his mission the Surgeon General placed primary emphasis on the development of a strong aggressive wartime program of military preventive medicine. This program was planned by the preventive medicine service in his office in Washington and the directors of preventive medicine in the major theater headquarters. It was put into action by Medical Service personnel in all the far-flung places where our troops served. Its effectiveness can be attributed to the cooperative action of the 10 million military persons who carried it out.

The preventive medicine service.—In 1940 the Surgeon General started in his office a formal organization which eventually became the preventive medicine service. It began with one officer and expanded rapidly until it became a major unit of his staff. By 1944 this service consisted of the following divisions: (1) medical intelligence, (2) epidemiology, (3) venereal disease control, (4) tropical disease control, (5) laboratories, (6) sanitation and hygiene, (7) sanitary engineering, (8) nutrition, (9) occupational health, and (10) civil public health. The chief of the service also organized the Board for the Control of Influenza and Other Epidemic Diseases in the United States Army and the United States Army Typhus Commission. This Board, composed of more than 100 civilian consultants to the Surgeon General, was divided into 10 special commissions, each of which was concerned with a specific problem of disease control. It was later called the Army Epidemiological Board and has now become the Armed Forces Epidemiological Board. The U. S. A. Typhus Commission, which was a

joint Army, Navy, and Public Health Service organization, was administered through the Secretary of War.

The broad objective which guided this service in all its planning was to use every possible facility in the nation—military and civilian—to keep the soldier well. To attain this objective it was necessary to apply all of the scientific information available to the prevention of disease and the conservation of military health and to promote research to discover and develop more effective control methods. In accomplishing this, the preventive medicine service enlisted the help of many highly qualified experts—at home and abroad—and it arranged for the assistance of numerous governmental and civilian agencies.

The Army's preventive medicine program included (1) general measures used to safeguard the soldier's health, (2) measures employed to protect him against specific diseases, and (3) the extensive research activities carried on in looking for better methods to control the diseases that might attack him. Although some of these activities were planned and supervised by divisions of the Surgeon General's office not formally included in the preventive medicine service, they were a part of the total program.

General health measures included the physical selection of healthy recruits; the provision of healthful clothing, housing, nutrition, and physical training; intensive training in hygiene; and sanitary control of the soldier's environment. The latter was handled cooperatively by the division of sanitation and hygiene and the division of sanitary engineering. It included providing for safe food and water supplies, for the sanitary disposal of wastes, and the control of many insect vectors and rodent reservoirs of disease. The importance of sanitation was emphasized in the training courses of all military personnel and special intensive training in the subject was provided for the Medical Service in the Medical Field Service School at Carlisle Barracks. The sanitary program was operated efficiently, especially in fixed installations, but it was difficult to maintain adequate sanitation under combat conditions and the filth-borne diarrheas and dysenteries and certain insect-borne diseases, especially malaria, caused much sickness in certain overseas locations. In the continental United States this program was relatively successful. The extensive work done by the Army in its camps and posts was supplemented in the surrounding civilian areas by sanitary programs operated through the U. S. Public Health Service by State health departments. This cooperative arrangement, which was initiated by the preventive medicine service in 1940, was of great importance. It produced results which have had a profound influence on the present status of civilian and military health in the United States.

The conquest of malaria in the United States.—A spectacular example is afforded by the present status of malaria. In 1940 the Army started an intensive program for the elimination of mosquitoes in all

military installations in this country. At our request, the U. S. Public Health Service supplemented this program with an extra-military mosquito control campaign. The Army program cost about 17 million and that of the U. S. Public Health Service about 19 million dollars. Considered as a whole, this was the most extensive mosquito-control program ever operated in any country in the history of the world. It was highly effective and although millions of men were trained in camps located in the Deep South, relatively few soldiers contracted malaria in this country. An important postwar outgrowth of this joint program was the establishment of the Communicable Disease Center with headquarters in Atlanta, Ga., which is continuing the fight against malaria and other diseases and is now helping to mobilize our extra-military defenses for the present emergency. It is reassuring to know that malaria, which once was a major affliction in the South, is now disappearing. Last year the State of Mississippi offered a bonus of $10 to any doctor who could find a new case of malaria, and not one case was reported. This story of the conquest of malaria in the United States is only one example of how the preventive medicine program of World War II exerted a powerful effect on the postwar health of the nation.

New insecticides.—Another outstanding contribution made by our department of sanitation and hygiene was the initiation and coordination of an extensive research program aimed at the development of more effective agents and methods with which to improve military hygiene and sanitation. One of the most helpful results of this work was the development of new wartime insect repellents and insecticides which have been used so successfully for the control of typhus, bubonic plague, dengue, malaria, and other important diseases. The story of the development of these new agents is a romantic tale of military achievement. Thousands of studies were made in many laboratories scattered all over the country, but the initiation, coordination and general guidance of the entire program of research and development was carried on in the division of sanitation of the Army preventive medicine service in Washington. The wartime development of DDT alone has been worth more than the total cost of the Army's entire research program during the war. DDT was the greatest contribution of the war, not only to military but to civilian health. It has freed us from the fear of typhus and it is now being used to conquer malaria, even in the tropics.

Prevention of specific diseases.—In addition to these general health measures, the Army's preventive medicine program included other activities designed to protect the soldier against specific diseases. The following divisions of the preventive medicine service were concerned with this phase of the problem: medical intelligence, epidemiology, laboratories, venereal disease control, and tropical disease control. They were assisted by the Army Epidemiological Board and by the Typhus Commission. The coordinated work of the members of these five divisions, the Board and the Commission, was concerned with

(1) the collection of exact information about the diseases that might attack American troops in any part of the world, (2) the analysis of current disease statistics, (3) the maintenance of adequate diagnostic and health laboratories for the identification of disease-producing organisms, (4) the development of policies, (5) recommendations for quick action to control threatened outbreaks of disease, and (6) the initiation of medical research in the laboratories and in the field to develop more effective control methods. Through these activities, the Surgeon General was kept informed at all times of the incidence of disease in our troops and in civil populations throughout most of the world. This enabled him to make intelligent plans for the protection of the troops.

Immunization.—Theoretically, the ideal method for the specific control of infectious diseases would be through immunization. Although only a limited number of effective immunizing agents have been discovered, those that are available have contributed much to the maintenance of America's fighting manpower. A conference of representatives of the Army, Navy, and U. S. Public Health Service held early in 1940 in Washington recommended active immunization against smallpox, typhoid, the paratyphoid fevers, and tetanus. It also recommended that immunization against certain diseases, including diphtheria, Rocky Mountain spotted fever, plague, and cholera, be used only when needed to meet local conditions. Later, other immunizing procedures were adopted for use under special conditions as, for example, the vaccines against epidemic typhus and yellow fever, both of which are considered effective. Experimental work also was done to develop vaccines against the dysenteries, the various types of encephalitis, influenza, et cetera. We still do not have a useful vaccine against the dysenteries; the vaccines against encephalitis and influenza still require improvement to meet the needs of the Army.

Occupational hazards and health.—The division of occupational health included branches dealing with (1) the health of workers in Army-owned industrial plants, (2) industrial hazards and accidents, (3) toxicology, and (4) the hazards of operating tanks and other mechanized Army transportation. This division initiated and supervised the activities of the Army Industrial Research Laboratory at Johns Hopkins University and the Armored Forces Research Laboratory at Fort Knox.

Civilian health in occupied countries.—The civil public health division was concerned with plans to protect the health of the civil population of conquered or liberated countries insofar as this influenced military activities. Throughout World War II this division worked closely with the medical intelligence division and with the War Department. It planned for the development of strong postwar civil health programs in Germany and Japan and it assisted in selecting much of the key personnel to work in these areas.

THE CONTROL OF DISEASES IN WORLD WAR II

The filth-borne gastrointestinal diseases, which include the typhoid fevers, the dysenteries and diarrheas, and cholera, have long been the scourge of armies operating in the field. During World War II, however, none of these diseases were important except the diarrheas and dysenteries which did cause much temporary illness in certain locations overseas.

The wartime prevalence of the acute respiratory diseases, including influenza and pneumonia, was higher than during the peacetime years from 1930 to 1940, but lower than the rates for World War I. The mortality from these diseases was greatly reduced, undoubtedly because of the widespread use of the sulfonamides and, later, penicillin.

All our previous wars have been accompanied by a great increase in venereal disease among troops and in the civil population. Venereal diseases have plagued armies since the beginning of time and have disabled American troops since the battle of Bunker Hill. The wartime program for the control of venereal diseases was comparatively effective in this country and in certain locations abroad. Compared with previous wars, there was a definite reduction in these diseases, but they are by no means under adequate control and they still constitute an important, unsolved problem for the future.

The tropical diseases were another important hazard because so much of the fighting was done in the Tropics. This had been anticipated by the Surgeon General, and for years military medical officers had been urging that more studies be made to discover better agents with which to protect troops in the field against tropical diseases. In addition to the insecticides previously mentioned, researches were directed at the discovery of an effective prophylactic drug for field use against malaria. Millions of dollars were spent in the search for new compounds which could be given to the soldier in the field to kill malarial sporozoites at the time of their injection by the bite of the mosquito. Although the ideal prophylactic has not yet been found, this research program proved to us that quinacrine, when properly used, will prevent falciparum but will only suppress vivax malaria. More important, it led to the discovery of a number of new antimalarial drugs. Some of these are highly effective for treatment in the clinical case and others, for example chloroquine, are more useful than quinacrine for suppression.

Although malaria was well controlled in this country, it was an important cause of illness in certain overseas locations, especially in the early part of the war. There were almost 500,000 admissions to hospitals during the war, and the rate was 18.9 per thousand per annum. These figures included many admissions for relapses. They do not give a true picture of the number of men infected as many cases were suppressed or cured by the routine use of quinacrine. Over 80 percent of these patients with clinical malaria were admitted to hospitals

overseas. Those treated in this country were largely relapses from infections contracted abroad. In general, the treatment was excellent and the death rate was not significant.

There were many other important tropical diseases, including dengue, filariasis and schistosomiasis, but none of these was as important as malaria. The tropical skin diseases were a serious problem in many places; this problem is still unsolved. There were various other disease problems, some of which still need attention, such as infectious hepatitis, the neurotropic virus infections, and trench foot. Considered as a whole, however, the health of the Army in World War II was much better than during any previous war. There were no great epidemics and many of the former plagues of war were completely controlled. In brief, the results show that within half a century military preventive medicine had advanced to the point where it paid rich dividends in the conservation of America's fighting manpower.

In the Spanish-American War the rate for deaths from disease among our troops was about 25 per thousand per annum; 13 American soldiers died of disease to every 1 killed in battle. In World War I the rate was reduced to about 16; the ratio of disease to battle deaths was 1:1. In World War II the disease death rate for our total Army of about 10 million men was only 0.6 per thousand per annum; in the European Theater only one soldier died of disease for every 85 killed in battle. This experience of the recent past shows that the field of preventive medicine and public health now has at hand methods which can be used to conserve both civilian and military manpower.

UNSOLVED PEACETIME HEALTH PROBLEMS

As we face the present national emergency, it is important to realize that in spite of the progress already made, many health problems must be solved if we are to conserve the nation's manpower in preparation for the threat of a long war. Even under the peacetime conditions of the last few years, too many civilians have been incapacitated or killed by preventable disease and accidents. The death rate for infectious diseases has been reduced, but they are not yet under control. The mental and degenerative diseases cause an enormous national loss in money and manpower. Other unsolved problems include occupational and industrial hazards and diseases, nutritional deficiencies, poor housing, atmospheric contamination, pollution of our streams with sewage and industrial wastes, and the need to conserve and protect the national water supply. There is much room for improvement in the field of maternal and child health; this was shown by the large number of physical and mental defects found in young men examined by the draft boards during the last war. Of those examined since June 1950, to bring the Armed Forces up to three and one-half million, one million have been rejected as physically, mentally, or morally unfit.

NEW DEFENSE HEALTH PROBLEMS

In addition to these unsolved peacetime civilian problems, we must also consider the new disease hazards of a modern war which might easily begin with an atomic attack on the United States and require the use of American troops both in this country and abroad. This means that both the civil and the military population must be prepared for the occurrence of unusual diseases which might accompany sabotage and bombing, and the disasters produced by atomic, biologic, or psychologic warfare. It also means that the civil health agencies must be prepared to combat a variety of diseases, many of which are now considered under control. In addition, the Armed Forces must be prepared to meet the wartime diseases which undoubtedly will be encountered in military operations. The existence of so many unsolved health problems at this late date in our national development is disappointing. It shows that although we Americans boast about health, we still do not have adequate health protection and that we still are not using our total resources for the prevention of disease. Therefore, if we as a nation are to provide and maintain the healthy manpower required in the present emergency and for the infinitely greater demands over an indefinitely long time in the future, we must organize a stronger defense health program.

IMPORTANCE OF PREVENTIVE MEDICINE IN THE DEFENSE PROGRAM

Our defense program must provide for both curative and preventive medicine. It is logical, however, even in peacetime to place the greater emphasis on preventive medicine in order to decrease expensive hospitalization and medical care. In time of war there is an added need to keep well people well because the entire population is needed for active duty either on the home front or in the fighting line. This means the new program must be aimed primarily at prevention. If our country is to make the most of its latent preventive facilities, the importance of preventive medicine must be re-emphasized. Every one in the field of medicine and public health should make it his business to know what needs to be done to prevent disease in this country and, regardless of his primary specialty, he should work unselfishly for the accomplishment of this objective. If all our 200,000 American physicians will apply the principles of preventive medicine to the families of their patients and give enthusiastic support to their community health programs; if all of the country's hospitals will accept the added responsibility of serving as real health centers for their communities with a view to keeping the people well; and if sufficient health agencies manned by adequate numbers of competent specialists are provided for the entire country, the physical, mental and moral fiber of the nation can be enormously strengthened.

This is not a utopian dream, but to accomplish it quickly is a task which will require many revolutionary changes. One basic need is for a thorough revamping of the curriculums of the 79 medical schools in order to give the medical graduate a better concept of the practical importance of preventive medicine and public health. He should be indoctrinated with the preventive attitude. This will help to prepare him for his wartime responsibilities either in civil defense or in the Armed Forces. It should also assist in recruiting the health specialists now urgently needed to man our official and nonofficial civilian health agencies and for the preventive-medicine organizations of the Army, Navy, and Air Force. By the same token, the military physician and surgeon should recognize his responsibility for preventive medicine in the Armed Forces. The strengthening of the civilian health program for the emergency will require the provision of additional local health units to cover the entire country and the taking of action to correct the present shortage in health specialists needed in the total civilian health program.

More health specialists required for the defense program.—The development of the emergency health program for the Armed Forces will require careful planning geared to meet the peculiar circumstances of the present threat against us. The Army, Navy, and Air Force must develop and implement sound mobilization plans for the rapid expansion of their programs of preventive medicine along lines which will enable them to carry forward all the advances now at our disposal. Each of the Armed Forces Medical Services now has a good peacetime division of preventive medicine; therefore, they are in a strategic position to prepare for war, but to expand the present programs sufficiently to meet the additional requirements (1) of our forces now fighting in Korea, (2) for the national mobilization and training activities now under way, and (3) for the still greater needs of another possible global war will call for large numbers of experts trained in every aspect of public health. Certain parts of this training can be provided within the respective services; but large numbers of the officers needed for key positions will require postgraduate training of the type now available only in the country's 10 accredited postgraduate schools of public health. It requires time to carry out such training, and therefore each of the services should rapidly develop adequate pools of specialists to meet their entire needs.

During the last war both military and civil health were handicapped because it was necessary for the Armed Forces to draw such personnel largely from the inadequate group of trained specialists required by the civil population. This weakened to a dangerous degree the staffs of civilian health agencies and the faculties of schools of medicine, dentistry, and public health. In the present emergency, this mistake must not be repeated, for to do so would be like destroying the goose that laid the golden egg. Large numbers of health specialists must therefore be recruited and mobilized; and this supply must be main-

tained in order to operate the nation's wartime military and civilian health programs. These specialists will include health administrators, epidemiologists, public health laboratory experts, public health nurses, health educators, biostatisticians, nutritionists, and industrial and sanitary engineers. For the key administrative and professional positions, there is urgent need for physicians who have the additional postgraduate training and experience required by the recently established American Board of Preventive Medicine and Public Health. The training required is now available only in the 10 accredited schools of public health.

At present these schools are graduating only about one-fifth of the specialists needed to fill key positions in the peacetime civilian health program of the country. This makes it clear that the national emergency will call for the recruitment of many additional health specialists and for expansion of the facilities for their postgraduate training. Although my subject has been military preventive medicine, I have dealt at some length with civilian public health because experience in both fields has taught me that the two are fundamentally similar and interrelated. They differ only in certain details of administration and application. The expert in military preventive medicine and the civilian public health specialist both operate by applying fundamental knowledge for the prevention of disease in their respective populations. They both need research aimed at the solution of unsolved problems. Civilian health has always influenced military health, and the reverse is also true. Today's emergency, which demands the mobilization of the entire nation, brings the military preventive medicine specialist and the civilian public health specialist more closely together than ever before.

Acute Lateral Ankle Sprains Treated by Sural Nerve Block[(1)]

James B. Hutcheson, *Lieutenant, junior grade, MC, U. S. N. R.*

SINCE the publication of an article (2) on local procaine injection in the treatment of sprained ankles, many physicians (3) (4) (5) have successfully used this technic. It is thought that the local injection of procaine inhibits the autonomic nervous stimulation at the sensory nerve endings in the injured tissue, thus preventing the vasodilatation and diffusion of fluids that in turn further stimulate these nerve endings. The purpose of this article is to describe an improved method of procaine injection in the treatment of acute lateral ankle sprains. To date this method has been used on nine patients, and the results have surpassed those obtained in a larger number treated by local injection directly into the injured area after the method of Leriche (2). This method of treatment was developed after it was discovered that injection of procaine into the sural nerve in acute ankle sprains gave excellent results and without the occasional recurrence of acute pain in the area 3 or 4 hours following direct injection in and around the sprained ligaments, which is believed to be caused by trauma added to the soft tissues by the multiple needle punctures.

TECHNIC

A point about 3 inches above the external malleolus and over the posterolateral border of the fibula is chosen for the injection. The surrounding hair and skin are prepared for injection. A skin wheal is

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(1) Norfolk Naval Shipyard, Portsmouth, Va.

(2) Leriche, R., and Froelich, F.: Traitement de certaines fractures articulaires par les infiltrations de novocaïne et la mobilisation active immédiate. Presse méd. 44: 1665-1666, Oct. 24, 1936.

(3) McLaughlin, C. W., Jr.: Novocain infiltration in treatment of acute ankle injuries without fracture. Surgery 20: 280-283, Aug. 1946.

(4) McMaster, P. E.: Treatment of ankle sprains; observations in more than 500 cases. J. A. M. A. 122: 659-660, July 3, 1943.

(5) Alexander, H. H., Jr.: Treatment of sprained ankle. Am. J. Surg. 50: 581-584, Dec. 1940.

raised with procaine through a 26-gage needle. A 2 inch 22-gage needle is substituted and is directed inward and posteriorly just beyond the posterolateral border of the fibula (fig. 1). The needle is inserted until a paresthesia, running downward from the site of injection, over and below the external malleolus and dorsolateral aspect of the foot, is experienced. Additional procaine is withheld until this point is reached, and then about 7 cc. of 2 percent procaine is injected and the

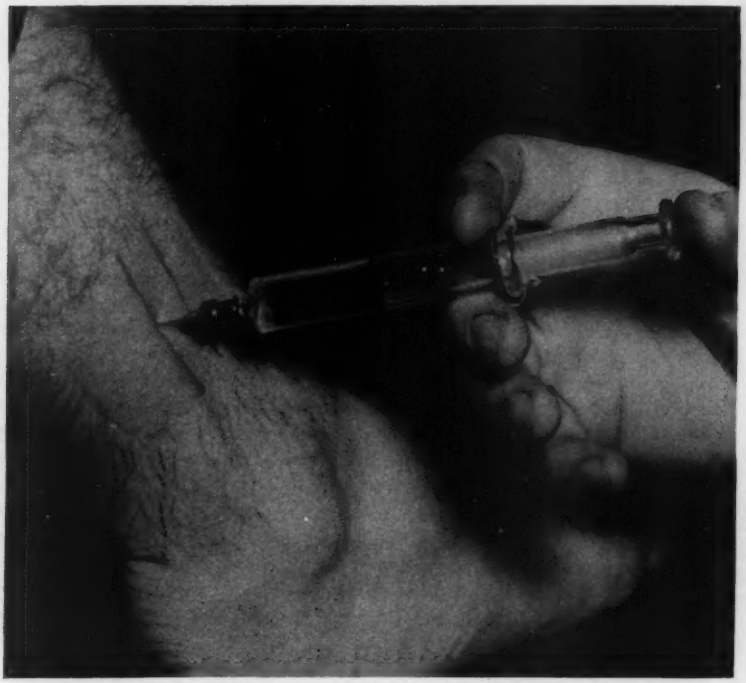

Figure 1.—Site of injection of procaine into the sural nerve. The outline of the fibula is marked on the skin.

needle is withdrawn. The plunger of the syringe should be pulled back before injection to be certain the needle is not in the small saphenous vein. After 10 minutes the area of anesthesia is determined. The skin from the point of injection downward over the malleolus and most of the skin over the dorsolateral aspect of the foot as far as the base of the toes will usually be found to be anesthetized and the pain in the injured tissues abolished. Only rarely will a second injection be necessary, but if any pain or tenderness persists, injection should be repeated at this time if the best results are to be obtained. Roentgenograms should be made to determine the presence of a fracture or abnormal rotation of the astragalus at this time. If neither is demonstrated, an elastic

bandage is applied to the ankle, and the patient is instructed to exercise the ankle freely for the next several hours.

RESULTS

Nine patients so treated have been followed for from 9 to 20 days. In no case has a second injection been necessary. The method is technically simple; it avoids the possibility of infection that occasionally follows injection into the injured area; and, by abolishing the added trauma to the already injured ankle, does away with the post-injection pain observed with the older method. It has also given better results than spraying the area with ethyl chloride. All patients were treated within 72 hours of injury and in four this method was successful after rest, elevation, and soaks had been unsuccessful. Most of the patients so treated were able to perform arduous duties, and the only time lost from work was that from the time of injury until the time of injection.

Surgery in Nonacute Diseases of the Pancreas[1]

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John J. Blumberg, M. D. (3)

THE choice of the term "nonacute" in preference to "chronic" in the title of this article was made to emphasize our conviction that surgical interference has no place in the treatment of acute conditions of the pancreas (4). Although both acute pancreatic edema and acute pancreatic necrosis are best treated conservatively, associated causative lesions in acute pancreatic disease, such as chronic cholecystitis with stones or choledocholithiasis, should be eradicated with interval operation and, furthermore, sequellas of acute lesions, such as lesser sac accumulations, require subsequent surgical care.

CONGENITAL DISEASE OF THE PANCREAS

Although rare, congenital lesions of the pancreas are occasionally encountered in pediatric surgery and often require surgical correction.

Annular pancreas.—Failure of proper embryonic rotation of the ventral pancreatic bud leads to an encirclement of the descending duodenum by a ring of pancreatic tissue with resulting partial or complete obstruction of the encircled bowel (fig. 1). Although the symptoms usually are those of duodenal stasis resulting from partial obstruction, in one of our patients the obstruction was practically complete, requiring surgical intervention (which was unsuccessful) several days after birth. The treatment for this condition poses a difficult problem. The temptation to divide or excise part of the encircling ring is great, but this procedure is not only associated with the danger of pancreatic fistula, but frequently fails to relieve the duodenal obstruction. Gastrojejunostomy has been employed with variable success. Duodenostomy or anterior duodenojejunostomy is the operative procedure of choice.

(1) Presented at the Monthly Medical Meeting, 18 January 1951, Army Medical Center, Washington, D. C.

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(4) Coffey, R. J.; Barnes, E. B.; Reed, P.; and Brandt, F. B.: Diagnosis and treatment of acute pancreatic disease. Postgrad. Med. 8: 191-196, Sept. 1950.

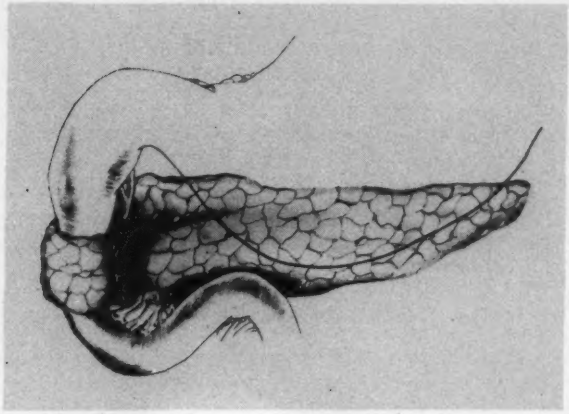

Figure 1.—Annular pancreas.

Aberrant pancreas.—The occurrence of ectopic pancreatic rests is not rare, but fortunately these nodules rarely attain sufficient size to produce symptoms. In a survey reported from the Mayo Clinic (5) aberrant pancreatic tissue was found in 1.7 percent of the cases at autopsy, and in 70 percent of these it was located in the stomach, duodenum, or jejunum. Its frequent occurrence in Meckel's diverticulums is well known. Although an aberrant pancreas may occasionally ulcerate, bleed, or cause obstruction, the important feature of this lesion to the surgeon is a knowledge of its occurrence and recognition of its presence.

Fibrocystic disease of the pancreas, pathologically characterized by diffuse cystic dilatation of the ductal system of the pancreas in which inspissated material collects, constitutes a difficult problem to the pediatrician. It often becomes a serious surgical problem as well. In 25 percent of our patients with this condition the development of meconium ileus has led to intestinal obstruction in the first few days of life. Depression or absence of tryptic activity in the deficient pancreatic juice causes failure of digestion of the meconium which then becomes an inspissated, tenacious, obstructing material in the lower intestinal tract, usually the terminal ileum. The differential diagnosis between this condition, meconium ileus, and congenital atresia is difficult in the newborn with lower intestinal obstruction. Although its recognition is usually delayed until the operation, the preoperative identification of deficient trypsin in the aspirated duodenal contents is diagnostic. Surgical intervention is usually required, at which time removal of the inspissated meconium by irrigation through an enter-

(5) Barbosa, J. J. deC.; Dockerty, M. B.; and Waugh, J. M.: Pancreatic heterotopia; review of literature and report of 41 authenticated surgical cases, of which 25 were clinically significant. Surg., Gynec. & Obst. 82: 527-542, May 1946.

ostomy catheter without exteriorization, or permanent ileostomy is the treatment of choice and should be supplemented during the postoperative period by the oral use of pancreatic extract.

CHRONIC PANCREATITIS

Chronic pancreatitis is not infrequently encountered although it occurs less often than the acute form of the disease. Of the 23 cases in this series, 16 were of the chronic relapsing type, i.e., they represented the cumulative damage of three or more attacks of acute pancreatic edema. This condition, characterized by scarring and calcification of the parenchyma of the pancreas and frequently by obstruction of the ducts, seriously impairs both the endocrine and exocrine function of the gland, leading to diabetes and chronic pancreatic insufficiency. Although consideration of the resulting diabetic state is not within the scope of this article, an understanding of the altered exocrine function may be enhanced by a review of our experimental studies in this field.

The currently held concept of the exocrine function of the pancreas is that pancreatic juice containing amylase, lipase, and trypsin is secreted into the duodenum, therein effecting the digestion of the various foodstuffs. Furthermore, it has been thought that prevention of the pancreatic juice from gaining access to the intestinal lumen because of obstruction or ligation of the ducts, or removal of the pancreas, simply leads to defective breakdown and absorption of these foods. Our studies, however, indicate that the physiology is not so simple as this. Following total pancreatectomy in dogs with insulin control of the subsequent diabetes, the resulting interference with food utilization is immediately pronounced, but, following avulsion of the pancreatic ducts, a procedure which just as effectively excludes the pancreatic juice from the intestinal tract, the early postoperative utilization of food was relatively good, and in subsequent metabolic studies a slowly developing disability occurred, reaching a maximum only after from 2 to 3 months. This disability coincided chronologically with the gradual degenerative changes in the obstructed pancreatic remnant in which all the acinar tissue was replaced after about 3 months, with the remnant at that time consisting only of a fibrous cord. The following experiment suggested an explanation of these findings. After avulsion of the ducts one dog temporarily exhibited abnormal fecal loss of fat, protein, and carbohydrate, but later the feces assumed normal appearance, the fecal loss of food became less, and the animal began to gain weight. After several months the dog was again operated on and a small nodule of apparently normal pancreatic tissue was found along the duodenum. This nodule was excised and was proved histologically to be composed of normal pancreatic tissue, representing by weight about one-thirtieth of a normal pancreas. Immediately following excision of this nodule metabolic studies demonstrated a maximal fecal loss of foodstuffs comparable to that seen after the total pancreatectomy. The following mechanism was suggested to us.

A factor is elaborated within the pancreas, but not contained in pancreatic juice, which, even in the presence of obstruction of the ducts, controls the utilization of fat in much the same way as insulin controls the utilization of carbohydrate. This view was strengthened by the recovery of unexplainably large amounts of split fat from the feces following avulsion of the ducts or total pancreatectomy plus the fact that in several experiments more fat was recovered from the feces than was ingested.

In order to investigate this problem further, an isolated intestinal loop was created in a number of dogs, and under controlled dietary conditions the fat excretion into this loop was determined daily by means of irrigation with a detergent solution. The fat excretion in these same loops was then determined following total pancreatectomy when an immediate increase was noted. After avulsion of the pancreatic ducts, however, fat excretion into this isolated loop failed to increase until 2 or 3 months later *(6)*.

Clinical features.—In summarizing the clinical features of our patients, a number of interesting facts was apparent. In 69 percent a history of recurrent acute episodes was elicited, leading to a diagnosis of chronic relapsing pancreatitis. Alcoholism of sufficient severity to be remarkable was noted in about one-third. In a similar number cholecystic disease was identified by cholecystography, operation, or autopsy. Of the two deaths in this series, one resulted from the development of acute pancreatic necrosis, the other followed resection of a cancer of the colon. Calcification of the pancreas, either of a localized or diffuse nature, was found in 26 percent, and this roentgenographic finding not infrequently directed attention to the pancreas in cases previously undiagnosed. Steatorrhea of sufficient degree to be clinically evident was found in 13 percent and, in this group, weight loss and malnutrition were characteristic. Intractable pain, usually epigastric and referred through to the back, dominated the clinical findings in 17.4 percent, and chronic diabetes, usually of moderate severity, was found in a similar number. Jaundice was present in 13 percent and pleural effusion in 8.7 percent of the patients. In both of these latter groups the aspirated pleural fluid was highly amylolytic.

Diagnosis.—In the relapsing cases in which a well-established recurrent pattern is accompanied by simultaneous elevations of the serum amylase, when calcification of the pancreas has been identified, or when unexplained diabetes or steatorrhea is present, the diagnosis is not difficult, but in the nonrelapsing type without the afore-mentioned findings, chronic pancreatitis may present a real diagnostic problem. The serum amylase is often not elevated, and in several patients was found to be abnormally low. In such circumstances we have succeeded in provoking a transient rise in serum amylase following stimulation of

(5) Whiting, W. B., and Coffey, R. J.: In press.

the pancreas with secretin, pilocarpine, or neostigmine. Our experience with serum lipase determinations and duodenal drainage studies has been too limited to comment on.

Treatment.—In many patients with established chronic pancreatitis treatment is of little or no avail, and for this reason measures directed towards prevention of chronic changes should be used. Inasmuch as the association of alcoholism is too frequent to be coincidental, abstinence from alcoholic beverages is imperative. Episodes of recurrent pancreatic edema, so often a precursor of chronic pancreatitis, are often associated with chronic cholecystitis and cholelithiasis. Eradication of such biliary tract disease will lessen the likelihood of subsequent episodes of pancreatitis. The definitive treatment of chronic pancreatitis depends principally on the predominant symptoms.

1. *Chronic pancreatitis with pain.*—In some patients intractable upper abdominal pain defies mild analgesia, and if the amount of opiates required for control is given, drug addiction becomes a real danger. Calcification in part or all of the pancreas is frequently present in these patients. In those with severe and intractable pain bilateral splanchnic block using 1 percent procaine should be employed, and if the pain is relieved, bilateral splanchnicectomy may be performed. In 5 such patients the results were excellent in 3. In 2 others in whom calcification was confined principally to the head of the pancreas, transduodenal exploration and dilatation of both ducts resulted in notable relief of pain.

2. *Chronic pancreatitis with pancreatic insufficiency.*—Pancreatic insufficiency, as manifested by steatorrhea, often leads to serious weight loss, fat-soluble vitamin deficiencies, and severe inanition. These patients should be literally stuffed with food. A high protein, high carbohydrate diet is usually best tolerated. Commercially available pancreatic extracts are woefully lacking in potency. There is no substitute for raw pancreas of which as much as 250 gm. may be incorporated into a single meal by a skilled dietitian without loss of palatability. Parenteral administration of the fat-soluble vitamins is usually desirable. Hepatomegaly in these patients indicates the development of a fatty liver, control of which requires the use of raw pancreas, choline, or lipocaic.

3. *Chronic pancreatitis with jaundice.*—The presence or definite history of obstructive jaundice during the course of chronic pancreatitis is an indication for surgical exploration of the common duct. The frequent demonstration of common duct obstruction in these patients makes this fact quite clear.

4. *Chronic pancreatitis with diabetes.*—The development of frank diabetes in 10 percent of these patients requires treatment which differs in no way from that for the average diabetic. Neglect of the diabetic state may, however, adversely effect the entire clinical course of the

disease, and in several such patients we have observed the intercurrent development of acute pancreatic necrosis.

PANCREATIC CYSTS

Cystic collections in and about the pancreas are by no means rare; they may be (1) true cysts, the majority of which are simple retention cysts, but may be dermoid, cystadenoma or cystadenocarcinoma, or echinococcus cyst; or (2) pseudocysts or lesser sac collections which are the more common type and develop as a result of pancreatic inflammation, necrosis, or trauma.

The *diagnosis* usually depends on roentgenographic demonstration of an extrinsic deformity of either the stomach or colon in the presence of a palpable upper abdominal tumor. The cyst may project anteriorly above the stomach, between the stomach and colon, or below the colon. One arising from the tail of the pancreas may be mistaken for an enlarged spleen. Mechanical obstruction of the gastrointestinal tract by a pancreatic cyst is rare, although in one patient complete duodenal stasis was found to have resulted from a pseudocyst in the region of the head of the pancreas (fig. 2). Following recovery from acute pancreatic edema or necrosis, or in the course of chronic pancreatitis, the development of a tender upper abdominal mass points to the diagnosis

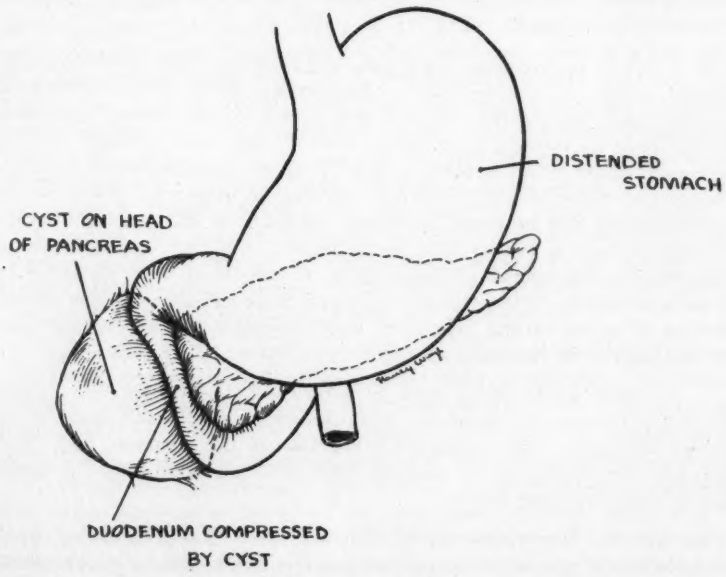

Figure 2.—Pseudocyst of head of pancreas with duodenal obstruction.

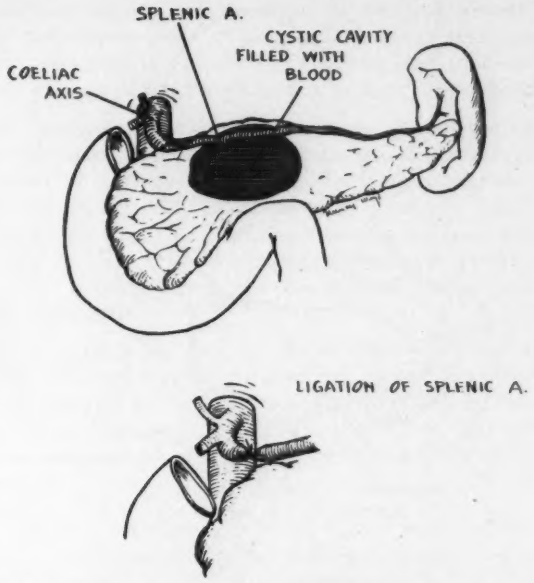

Figure 3.—False aneurysm of splenic artery simulating lesser sac accumulation.

of a pseudocyst. Not all fluctuant collections in the lesser sac, however, result from pancreatic disease. In one of our patients a large hematoma in this region resulted from splenic artery hemorrhage (fig. 3). Confirmation of the diagnosis of a pancreatic cyst may be obtained by the demonstration of a high amylolytic titer in the aspirated contents.

The *treatment* of a pancreatic cyst depends entirely on its nature, location, and size. True retention cysts, especially if located in the body or tail, should be excised in toto if possible. In treating pseudocysts, which lack a true lining and are associated with adjacent inflammation, total excision is impossible, and either evacuation plus packing or marsupialization is required. Excision of a cyst of the pancreatic head carries with it the great danger of a subsequent pancreatic fistula. Marsupialization and drainage is well suited to cysts of large dimensions, but often the smaller size of a lesser sac collection precludes such a maneuver, in which case we have employed simple evacuation and packing. Although these external drainage methods are conducive to the development of a pancreatic fistula, internal drainage is seldom justified. We have employed it only in the case of a recurrent pseudocyst, using the Y principle employed in Roux' gastroenterostomy "en Y" (fig. 4). Cystadenocarcinoma is seldom found to be operable, and as a palliative measure marsupialization may permit direct application of irradiation.

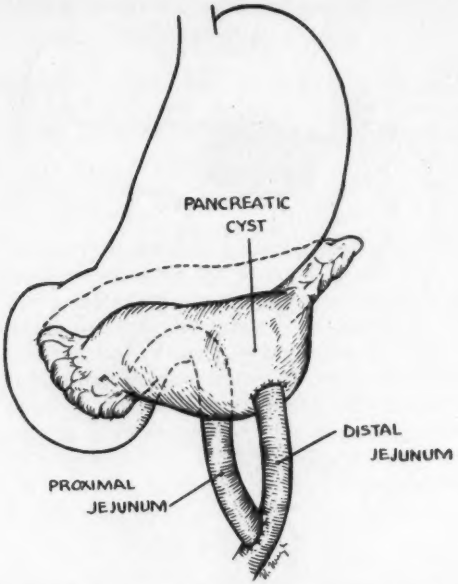

Figure 4.—Technic of internal drainage of recurrent pseudocyst of pancreas.

PANCREATIC FISTULA

Escape of pancreatic juice to the exterior via the abdominal wall is a distressing situation to both the patient and the attending physician. Not only does serious disturbance of the fluid and electrolyte balance result, but tryptic digestion of the exposed skin and underlying tissues may lead to extensive tissue loss. All pancreatic fistulas have resulted from either (1) drainage of a pancreatic cyst, (2) operative injury of the pancreas, or (3) penetrating trauma of the pancreas. Marsupialization of a pancreatic cyst is invariably followed by drainage of variable amounts of pancreatic juice, as is evacuation and packing of smaller pseudocysts. Severance or injury of the major pancreatic duct occasionally occurs during a gastric resection for duodenal ulcer. Implantation of the major pancreatic duct into the jejunum as a part of a pancreatoduodenostomy may result in leakage and fistula formation. The danger of establishing a fistula has prompted us to avoid the use of needle biopsy of the pancreas. We have observed one patient in whom a knife wound of the abdomen, involving the body of the pancreas, resulted in a fistula.

Treatment.—The handling of any patient depends largely on whether the fistula has resulted from complete or major duct severance, or from partial or minor injury of the duct. In the former condition the loss of

fluid and sodium presents a serious metabolic problem and the likelihood of spontaneous closure is slight. In the less severe ductal injuries, the total volume loss of pancreatic juice is less, the fluid and electrolytic imbalance is seldom significant, and in most instances spontaneous closure of the fistula occurs in less than 6 months.

1. *Local therapy* is designed to prevent the digestive effect of trypsin on the exposed tissues of the abdominal wall. Insertion into the fistulous tract of a catheter to which continuous suction is applied with a Stedman pump will, in most cases, suffice. Painting of the adjacent skin with powdered aluminum paste is advised. When maceration develops in spite of these measures, treatment should be supplemented by the application of sponges soaked in beef extract, thus inactivating the trypsin.

2. *General measures* are directed toward control of fluid and sodium loss (by adequate replacement with normal saline); and depression of the secretory activity of the pancreas, thus diminishing the output via the fistula (it has been well established that a low carbohydrate diet, sodium bicarbonate given orally and ephedrine are effective measures in this regard).

TABLE 1.—*Summary of 12 cases of pancreatic fistula*

Origin	Number	Spontaneous closure	Operative correction
Marsupialization of cyst	6	5	1 (into stomach)
Packing cyst	1	1	
Pancreatoduodenectomy	2	2	
Gastric resection	2	1	1 (into jejunum)
Knife wound	1		1 (partial pancreatectomy)

3. *Operative therapy* is not often required. Except when division of a major duct has occurred, spontaneous closure usually occurs. In our series, operative interference was required in 3 of 12 cases (table 1). In 2 of these the persistent outpouring of a large volume of pancreatic juice with gradual deterioration of the patient's general nutrition indicated a major ductal injury, but in the third a fistula following marsupialization of a lesser sac accumulation had persisted for 18 months. Implantation of the proximal end of the fistulous tract into the stomach or upper intestine is usually performed (fig. 5), although total excision of the tract plus partial pancreatectomy may be preferable when the fistula arises from the tail or body of the pancreas (fig. 6).

TUMORS OF THE PANCREAS

Although a great variety of tumors of the pancreas have been reported, for practical purposes there are two main types: (1) duct or acinar adenocarcinoma, and (2) hyperfunctioning islet cell adenoma or carcinoma.

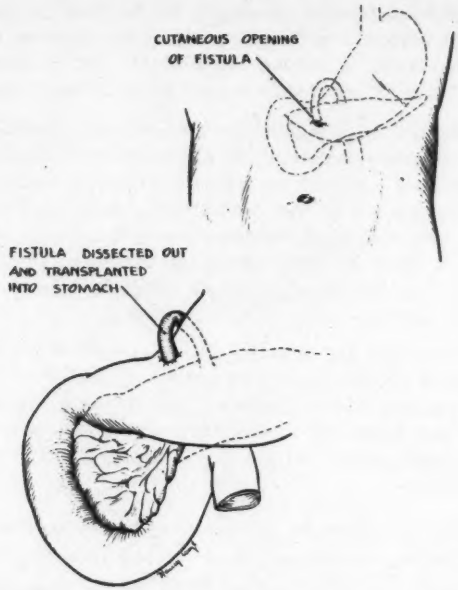

Figure 5.—Implantation of fistula into stomach.

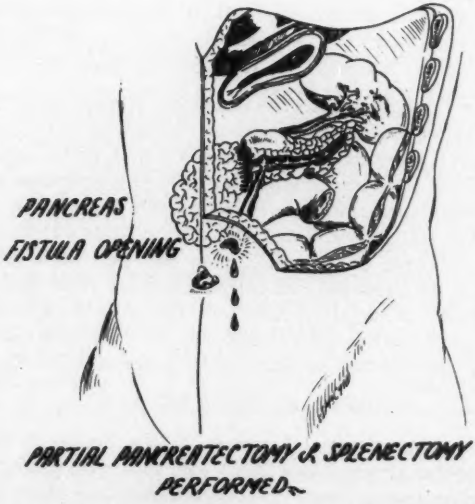

Figure 6.—Fistula arising from body of pancreas.

Adenocarcinoma of duct or acinar origin develops more commonly in the head than in the remainder of the pancreas, the ratio in our patients being 9:1. Cancer of the head of the pancreas is associated with the well-known symptomatology of deep-seated upper abdominal pain, anorexia, weight loss, and progressive jaundice. A palpably dilated gallbladder is a significant physical finding. Formerly confined to palliation, modern surgical treatment is directed toward curative extirpation of the lesion. As a result of Whipple's efforts it is now well established that surgical resection of the pancreas, in part or whole, plus removal of the duodenum and lower common duct, is compatible

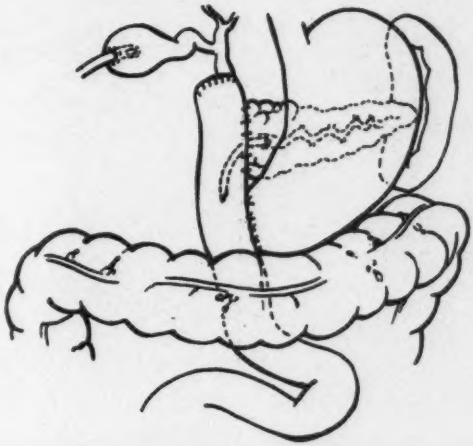

Figure 7.—Technic of one-stage pancreatoduodenectomy.

with continued well being. Despite the disappointing salvage rate with radical resection for cancer of the head of the pancreas, our experience has led us to continue the use of this procedure (fig. 7). In a series of 16 radical pancreatoduodenectomies in the past 4 years, we note the following significant experiences:

1. The operative mortality of 25 percent resulted entirely from the early development of a hepatorenal syndrome rather than from technical defects.

2. Unsuspected extrapancreatic neoplastic lesions (2 carcinomas of the ampulla of Vater and 1 carcinoma of the lower common duct) causing obstructive jaundice were found in 3 patients. (Two of these patients were living without evidence of recurrence 2 years later.)

3. Inflammatory lesions (chronic pancreatitis, impacted and ulcerated calculus of ampulla) were mistaken for a neoplasm in 2 patients, both of whom showed little or no evidence of pancreatic insufficiency.

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4. The 2 survivors of cancer of the head of the pancreas, 1 for 2 years and 1 for 18 months, afford some hope of salvage.

Carcinoma of the body or tail of the pancreas presents one of the most difficult diagnostic problems in intra-abdominal disease. Although early diagnosis is rare, proper and prompt investigation of any of the significant triad of symptoms (ascites, unexplained phlebitis, and splenomegaly) will on occasions permit an operative attempt at curative resection.

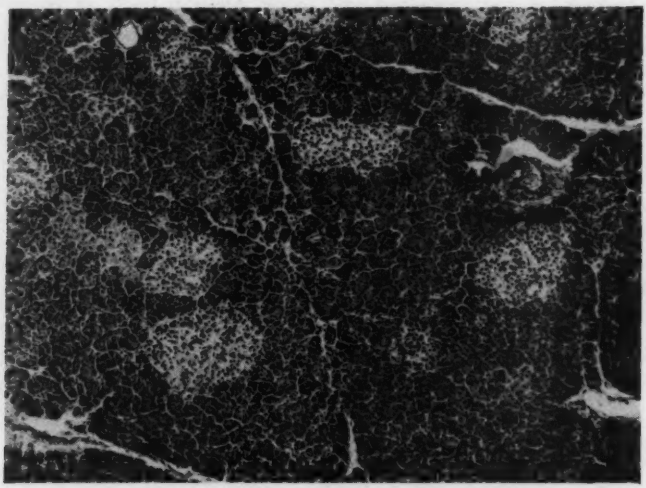

Figure 8.—Body of pancreas revealing unusual number of islets. (Hematoxylin-eosin stain.)

Islet cell adenoma is a relatively rare tumor, about 200 cases having been reported. Because they secrete an excess of insulin, these tumors produce symptoms and signs of hyperinsulinism. The true diagnosis, often confused with neurosis, brain tumor, epilepsy, narcolepsy, or alcoholism depends on exclusion of all other causes of hypoglycemia in a patient in whom a rather persistent blood sugar of less than 50 mg. per 100 cc. is demonstrated. Once the diagnosis is established, surgical exploration of the pancreas, preferably through a transverse abdominal incision, should be performed. The average size of the tumor is 1.5 cm. and the majority occur in the body and tail. Slightly less than 10 percent of these tumors are multiple. In a few instances an islet cell adenoma of an aberrant pancreas has been reported. Careful palpation of the gland will usually reveal the presence of the lesion, but in the event of a negative exploration, resection of the tail and body is probably advisable. In one patient histopathologic study of the resected pancreas revealed only an abnormally large number of islets (fig. 8).

Cure in Diabetic Gangrene

Report of a Case

Jack Fishman, *Lieutenant Commander, MC, U. S. N. R.*

A 62-YEAR-OLD woman gave a history of controlled diabetes mellitus for 33 years. Aside from this she was well until 14 months before she was seen by us when she scraped a callus on the medial surface of the right great toe and developed a painful infection with a purulent draining ulcer (fig. 1). After 4 months of local treatment without benefit, she was admitted to a hospital where a slightly depressed ulcer about 1 cm. in diameter with a black crust was noted on the medial surface of the right great toe. A roentgenogram of the right lower extremity revealed marked calcification of all the arteries, including the anterior and posterior tibials. Severe osteoporosis of the bony structures was also noted. A right lumbar sympathetic nerve block was performed without benefit and it was concluded that a sympathectomy was not indicated. For 1 month the treatment consisted of diet, insulin, warm saline soaks, and débridement.

Figure 1.—Appearance of right foot after local therapy.

The patient was then admitted to another hospital where she remained during the sixth and seventh month of this pedal complication. Here additional therapy consisted of an oscillating bed, a heating pad to the abdomen for reflex heat, and injections of vitamin C. Despite this treat-

ment the ulceration on the right toe became larger and deeper and a purulent sinus developed. Incision and drainage with débridement of this area was performed. Based on the medical observation of another patient with thromboangiitis obliterans, who was clinically improved while taking adrenocortocotrophic hormone (ACTH), that type of therapy was given to this patient. Injections of 25 mg. of ACTH q. i. d. for 2 weeks failed to improve the circulation of the right leg or halt the progression of the gangrenous process. The ulcer at the base of the toe became deeper and darker in appearance and the discharge increased.

During the eighth month, an infra-red lamp and potassium permanganate soaks were used without benefit. Maggots, appearing in the wound, were immediately eradicated with the local use of ether. The infection appeared to be extending along the flexor tendon sheaths toward the heel (fig. 2) and narcotics were necessary to control the pain. A roent-

Figure 2.—Progression of the gangrenous process.

genogram of the right foot at this time disclosed, in addition to the previous findings, evidence of osteomyelitis of the right great toe. The patient was taken to the operating room where a débridement of the right foot was performed under general anesthesia. The wound was incised and extended from the base of the right great toe along the medial margin of the foot to the anterior portion of the heel. Gangrenous subcutaneous tissues, tendon sheaths, and tendons were excised and the skin margins were débrided. The head of the first metatarsal bone was trimmed with a rongeur and the wound was packed with aureomycin ointment. During the operation arteriosclerotic vessels were noted and no bleeding was evident.

Figure 3.—Right foot completely healed after treatment with benzazoline hydrochloride (priscoline).

From the ninth to the twelfth month the treatment included packing of the wound with antibiotic ointment and the use of benzazoline hydrochloride (priscoline), in addition to diet, insulin, and bed rest. Warm saline foot soaks were also used prior to dressing the wound. Fifty milligrams of priscoline was injected directly into the right femoral artery, once daily, for 2 months and twice weekly thereafter along with the oral administration of 25 mg. of priscoline t. i. d. During this treatment the pain disappeared and healthy vascular granulation appeared in the wound. This granulation bled readily when disturbed. Following each injection erythema and cutis anserina appeared on the leg with an immediate marked increase in the surface temperature. An attempt was made to insert and retain a nonclotting type of tubing in the femoral artery for the purpose of administering the priscoline more frequently, but this was found to be impractical. The wound gradually healed completely (fig. 3) and the patient was able to walk.

Clinical Uses of Hexachlorophene

Curtis P. Artz, *Major, MC, U. S. A.* (1)

Edwin J. Pulaski, *Lieutenant Colonel, MC, U. S. A.* (1)

Joseph R. Shaeffer, *Colonel, MC, U. S. A.* (2)

HEXACHLOROPHENE is the generic term for bis-(2-hydroxy-3,5,6-trichlorophenyl)methane, commonly referred to as G–11. It is a white, crystalline, odorless powder which is insoluble in water but is soluble in alcohol, acetone, and dilute alkalies. It is more soluble in alkaline than in neutral or acid media. It is highly bacteriostatic for many gram-positive bacteria, and less so for gram-negative micro-organisms (3). Antibacterial activity is challenged by the presence of serum and organic matter, but not necessarily completely nullified (4). This compound is usually incorporated in bar soap, liquid soap, or a water-miscible emollient detergent. In these media it is stable and bacteriostatically active. Experience extending over a period of 5 years has validated the claim that G–11 is nonirritating and hypoallergenic. In contradistinction to mercurial disinfectants, repeated applications to the skin over long periods have not resulted in sensitization phenomena.

The bacteriostatic properties of soap, though not inconsiderable, are secondary to its cleansing action. Numerous studies, particularly those of Price (5), have demonstrated that a 10-minute scrub with soap is remarkably effective in the removal of a high percentage of so-called transient bacteria which come to rest on the skin surface but are incapable of remaining there. Bacteria resident in hair and sweat follicles

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(1) Surgical Research Unit, Brooke Army Hospital, Fort Sam Houston, Tex.

(2) Surgical Service, Brooke Army Hospital, Fort Sam Houston, Tex.

(3) Price, P. B., and Bonnett, A.: Antibacterial effects of G-5, G-11, and A-151, with special reference to their use in production of germicidal soap. Surgery 24: 542-554, Sept. 1948.

(4) Seastone, C. V.: Observations on use of G-11 in surgical scrub. Surg., Gynec. & Obst. 84: 355-360, Mar. 1947.

(5) Price, P. B.: Bacteriology of normal skin; new quantitative test applied to study of bacterial flora and disinfectant action of mechanical cleansing. J. Infect. Dis. 63: 301-318, Nov.-Dec. 1938.

are relatively unharmed by scrubbing. These deeply entrenched resident bacteria proliferate once they emerge to the skin surface and, together with the unharmed transient bacteria, soon re-establish the normal bacterial population of the skin. The normal resident bacteria are predominately staphylococcic and are not susceptible to the action of soap.

To compensate for the bactericidal deficiency of soaps, various attempts have been made to augment the action of soap with such germicides as organic mercurials, phenol, and quaternary ammonium compounds, but the factors of toxicity, skin irritation, and chemical incompatibility have precluded their satisfactory use. Concurrent with the development of aseptic surgery came the elaborate 10-minute brush scrub, followed by soaking the hands in an antiseptic solution. The lengthy scrub, plus the defatting and drying effects of such accepted antiseptics as 70 percent alcohol and quaternary ammonium compounds, resulted frequently in varying degrees of dermatitis and unpleasant skin irritation.

In 1944, Traub, Newhall, and Fuller *(6)* pointed out the value of G–11 incorporated in soap in reducing the bacterial flora of human skin. Since then, favorable evaluations of its use as a scrub for the surgeon's hands, and as a single agent for preparing skin areas prior to operation, have been reported *(7-13)* Seastone *(4)* states:

"The incorporation of hexachlorophene (G–11) into soap used for the preparation of the surgeon's skin reduced the number of skin organisms considerably below those found after conventional scrub procedures. Broadly speaking, bacterial counts of the washing of untreated hands range in millions of organisms per liter. Conventional surgical scrubs,

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(6) Traub, E. F.; Newhall, C. A.; and Fuller, J. H.: Value of new compound used in soap to reduce bacterial flora of human skin. Surg., Gynec. & Obst. 79: 205-216, Aug. 1944.

(7) Clark, D. G. C.; Lockwood, J. S.; and Lewit, E.: 2,2'-dihydroxy-3,5,6-3',5'6' hexachlorodiphenylmethane (G–11) as antiseptic for use in surgical scrubbing. Surgery 22: 360-366, Aug. 1947.

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(10) Dull, J. A.; Zintel, H. A.; Ellis, H. L.; and Nichols, A.: Evaluation of pH-isoderm G–11 and liquid soap containing G–11 when used as preoperative scrub. Surg., Gynec. & Obst. 91:100-104, July 1950.

(11) Hufnagel, C. A.; Walter, C. W.; and Howard, R. W.: In vivo method for evaluation of detergents and germicides. Surgery 23: 753-759, May 1948.

(12) Freeman, B. S., and Young, T. K., Jr.:Clinical study of use of synthetic detergent (pHisoderm) combined with hexachlorophene for disinfection of skin. Surgery 25: 897-901, June 1949.

(13) Kraissl, C. J.: Clinical and laboratory evaluation of G–11 (hexachlorophene) as preoperative skin bacteriostatic agent. Plast. & Reconstruct. Surg. 5: 471, June 1950.

followed by germicidal rinses, reduce the number about tenfold, and the hexachlorophene wash accomplishes a reduction of about a thousandfold from normal skin counts."

Clark, Lockwood, and Lewit *(7)* report that when subjects wore surgical gloves containing nutrient broth for 60 minutes after the scrub, those who had used the G–11 soap showed a decrease in skin bacteria to about 50 percent of the count at the beginning of the hour, whereas the control subjects, using plain soap, showed an *increase* of about 100 percent over the population present when the gloves were put on. Dull et al. *(10)* have shown that a single 3-minute scrub with pHisoderm (a water-miscible detergent emulsion containing ether sulfonate, lanolin cholesterols, petrolatum, and lactic acid) with 3 percent G–11 (hereafter referred to as G–11 detergent) produces an immediate postscrub degermination equivalent to a 10-minute scrub with bland cake soap.

One of the factors which may explain the high activity of G–11 is that the compound is taken up by the skin and retained for some time, exerting a constant bacteriostatic or possibly bactericidal action on the skin bacteria *(6)*. It has been shown by Traub, Newhall, and Fuller *(14)* that the thin layer of retained G–11 does not obscure the bacteria of the skin beneath the imperceptible film, but actually kills the bacteria. G–11 has been recovered from skin 2 days after 3 consecutive daily 6-minute applications of 1 percent solution in liquid soap *(15)*

Freeman and Young *(12)* reported that the incidence of all wound infections in clean and contaminated cases was decreased by preparing the skin preoperatively with G–11 detergent. In their control series of 368 patients prepared by a 10-minute scrub with soap followed by alcohol, ether, and zephiran chloride (hereafter referred to as "routine scrub") the incidence of wound infections was 8 percent. In a strictly comparable series of 328 patients prepared by a 4-minute scrub with G–11 detergent, wound infections were seen in only 2 percent. They conclude that a 4-minute preparation with this new compound has proved superior to the previously accepted "routine scrub" in reducing wound infections in a statistically significant series.

Kraissl *(13)* reported a similar study evaluating G–11 as a preoperative skin bacteriostatic agent. In 9,010 laboratory tests on highly contaminated skin he found that the greatest bacteriostatic efficiency was obtained with a combination of G–11 soap and tincture of G–11. In 564 laboratory tests on patients' skin G–11 soap alone was found to be an efficient preoperative preparation if left in contact with the skin

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(14) Traub, E. F.; Newhall, C. A.; and Fuller, J. R.: New cutaneous bactericidal agent used in soap; further practical studies. Arch. Dermat. & Syph. 52: 385-388, Nov.-Dec. 1945.

(15) Fahlberg, W. J.; Swan, J. C.; and Seastone, C. V.: Studies on retention of hexachlorophene (G–11) in human skin. J. Bact. 56: 323-328, Sept. 1948.

for a sufficient time. It has a persistent effect, giving a higher percent of negative cultures after operation than at the beginning. Kraissl recommended that G–11 soap solution be used to produce a lather for shaving the skin the day before operation. Immediately before operation the skin should be thoroughly washed with G–11 soap for 90 seconds, the lather removed with a sterile towel and another 90-second wash with G–11 accomplished prior to the application of sterile drapes.

PROCEDURE

Prior to operation the "routine scrub" was used in one-half of the operating rooms during the first part of the study. In the other rooms the skin was prepared with G–11 detergent. The operative site was cleansed with two large sterile gauze sponges saturated with sterile distilled water and G–11 detergent. With one sponge in each hand, the surgeon developed a good lather and scrubbed the area for 3 minutes. Following this cleansing, the lather was removed with sterile gauze. The average abdominal preparation required 20 ml. of the G–11 detergent. During the second period of the study, the "routine scrub" replaced G–11 detergent in half the operating rooms and the other rooms changed to G–11 detergent. The experiment was carried on for about 8 months, during which time there was no appreciable change in the personnel. The skin preparation was performed by resident surgeons and particular attention was paid to standardization of the procedure. Only clean cases were included in the study. An elliptical piece of full thickness skin, 1½ inches by ½ inch, was removed from the operative site at the beginning of each operation. This was divided longitudinally into two sections and sent to the laboratory in a sterile Petri dish. One section was swabbed on a blood agar plate and the other dropped into a tube of cooked meat broth. The plates were observed in 48 hours and the meat media was examined in 14 days. When growth of bacteria was evident, the organisms were identified.

TABLE 1.—*Biopsy specimens showing no growth on culture*

Culture method	Percent of 201 patients prepared with "routine scrub"	Percent of 197 patients prepared with G-11 detergent
Cooked meat broth media	54	54
Blood agar plate	79	70

RESULTS

Skin biopsies were obtained from 201 patients following the "routine scrub" and from 197 scrubbed with G–11 detergent. The percentage of specimens from which no bacteria could be grown is shown in table 1. The difference between the findings of 79 percent and 70 percent with no growth on the blood agar plates is not statistically significant. It appears that a short preoperative 3-minute scrub with G–11 detergent

is as efficacious as the generally accepted "routine scrub." In table 2 are shown the organisms recovered on blood agar plates after each type of preparation. Coagulase-negative micrococci predominated. Accurate data were kept on the wound complications of patients prepared by each method. The wound infection rate in the "routine scrub" series was 5.5 percent and in the G–11 detergent group 5.07 percent. No evidence of skin reaction or irritation was noted in the patients on whom the G–11 detergent was used. The incidence of wound infection is probably not an accurate method of determining the efficiency of preoperative skin preparation. It cannot be proved that in each infection unsterile skin was the direct cause for the wound sepsis. Other factors in wound healing, such as (1) the general condition of the patient with reference to blood proteins, erythrocyte count, and vitamins, (2) the type of operation, (3) the technic of the operation, especially the size of the suture material, the amount of tension, trauma to the tissue, and the use of drains, and (4) the postoperative care, including antibiotics and degree of motion of the part operated on, are so variable that a statistical analysis of postoperative infection means little in determining the value of the skin preparation.

TABLE 2.—*Organisms recovered from biopsy specimens on blood agar plates*

Organism	Percent of 201 patients prepared with "routine scrub"	Percent of 197 patients prepared with G-11 detergent
Hemolytic *Staphylococcus aureus*, coagulase negative	77	75
Nonhemolytic *Staphylococcus aureus*, coagulase negative	21.5	23
Hemolytic *Staphylococcus aureus*, coagulase positive		0.5
Nonhemolytic *Staphylococcus aureus*, coagulase positive		0.5
Pseudomonas		0.5
Proteus	0.5	
Diphtheroids		0.5

DISCUSSION

Preparation of the skin by a 4-minute scrub with G–11 detergent followed by a zephiran chloride wash, has been recommended *(12)*. Some surgeons believe that an additional advantage accrues when the skin is washed 24 or 48 hours prior to operation with a G–11 compound, as well as immediately preoperatively *(8) (13)*. In our series a 3-minute preoperative scrub with G–11 detergent proved very satisfactory. The continued protection afforded by G–11 during the operation is an advantage. No advantage accrued from an alcohol rinse, nor from the use of quaternary ammonium compounds or other germicidal agents after the surgical wash *(4)*. On the contrary, alcohol partially or entirely removed the deposited protective film of G–11.

The use of a G–11 compound greatly simplifies and hastens the preoperative procedures in the operating room. The surgeon and his team can prepare their hands safely in 3 minutes. The operative area can be prepared with G–11 detergent in less than half the time required for the "routine scrub." Only one basin of sterile distilled water is required on the "prep" tray for the G–11 detergent, whereas 4 sterile basins are necessary for the "routine scrub." The diminution in the preparation of required sterile containers and solutions makes for economy in the nurses' time. The use of G–11 detergent should be particularly efficacious in the operating theater under combat conditions, because the same compound can be used for more rapid preparation of both the surgeon's hands and the operative area, and a less elaborate tray of equipment is required. Under conditions of warfare, when frequent dressing of open wounds is often impossible, the prolonged reduction by G–11 of the number of resident bacteria would be beneficial.

The amount of G–11 detergent required for each skin preparation is about 20 ml. About 5 or 6 ml. are necessary to cleanse the surgeon's hands. It has been estimated that a gallon of this material is sufficient for the preparation of 200 operative areas or for 700 surgical hand scrubs. The cost of a single skin disinfection with the "routine scrub" at this hospital was found to be 17 cents as compared with 3 cents for the G–11 detergent. In the past year the G–11 detergent has also been used in this hospital for the cleansing of traumatic and infected wounds, and as a cleansing agent at the time of débridement of freshly burned surfaces. At no time has there been evidence of tissue trauma or delayed wound healing. Skin reactions or excoriations have not been seen. Although G–11 has been reported to be inactivated by serum *(4)*, the G–11 detergent served as a good mechanical cleansing agent on raw and denuded surfaces, and gave additional and prolonged protection of the wound by reducing the bacterial flora of the surrounding skin. It has been advocated also for disinfecting the skin prior to the application of plaster casts *(12)*. Its daily use is advised in the management of pyogenic skin infections, such as folliculitis.

SUMMARY

Skin biopsies were obtained on 201 patients whose skin was prepared for operation with green soap, alcohol, ether, and tincture of zephiran chloride, and from 197 patients after preparation by a 3-minute scrub with pHisoderm containing 3 percent G–11 and sterile distilled water. Fifty-four percent of the biopsy specimens in both series showed no growth after 14 days in cooked meat broth. Seventy-nine percent of the biopsies with routine preparation, and 70 percent with G–11 detergent, showed no growth after 2 days on blood agar plates. It would appear that a 3-minute scrub with G–11 detergent is as efficacious in eliminating bacteria on the skin preoperatively as in a 10-minute scrub with the usual routine. The organisms present after either type of preparation were predominantly coagulase-negative hemolytic and nonhemolytic

Staphylococcus aureus. There was no appreciable difference in the wound infection rate following each type of preoperative cleansing. The advantage of using a single agent for scrubbing the patient's skin and the surgeon's hands is evident. The cost of disinfection of the average operative site with G–11 detergent is less than one-fifth the cost with soap, alcohol, ether, and zephiran chloride. The efficacy of G–11 detergent in cleansing and lowering the bacterial count of the skin, the absence of skin irritation, and the saving in time and money make its use highly advantageous.

Neuropsychiatry[1]

Organization and Administration in the Office of the Surgeon General, 1948–1950

John M. Caldwell, *Colonel, MC, U. S. A.* (2)

IN THE last few years the Army Medical Service has been faced with ever increasing responsibilities and these responsibilities have been notably increased since 25 June 1950 with the hostilities in Korea. A brief report has been made on neuropsychiatric activities for the years 1942 to 1947 (3). Events since may be discussed under various specific headings.

PSYCHIATRY AND NEUROLOGY CONSULTANTS DIVISION

The mission of neuropsychiatry in the Army Medical Service is to provide the highest standard of professional care in the prevention, diagnosis, and treatment of emotional and personality problems, mental disorders, and neurologic diseases occurring in military personnel. It is the function of the Psychiatry and Neurology Consultants Division (4) to report to and advise the Surgeon General on all matters pertaining to psychiatry, neurology, mental hygiene, clinical psychology, and social work. During World War II nine officers were assigned to the Division. From a low of two officers in 1946, the Division at present has three medical officers, one administrative officer, two clinical psychologists, and two psychiatric social workers assigned.

The organization and functions of neuropsychiatry (5) (6) (7) (8) (9) in hospitals, clinics, and field medical units have been described and

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(1) Presented before the Philadelphia Psychiatric Society, 1 February 1951.

(2) Psychiatry and Neurology Consultants Division, Office of the Surgeon General, Department of the Army.

(3) Caldwell, J. M.: Organization and administration of neuropsychiatry in the office of The Surgeon General. I. 1942-1947. Mil. Surgeon 107: 19-25, July 1950.

(4) Psychiatry and Neurology Consultants Division, Manual, Office of The Surgeon General, Organizations and Functions 10: 15, Jan. 1951.

(5) AR 40-605, June 1949, Medical Service—Neuropsychiatry.

(6) SR 40-1025, 2 June 1949, Medical Service—Joint Armed Forces Nomenclature and Method of Recording Psychiatric Conditions.

(7) SR 615-180-1, Apr. 1950, Enlisted Personnel—Joint Examining and Induction Station Procedures.

(8) SR 615-110-5, Feb. 1949, Enlisted Personnel—Reception Processing.

(9) Basic Military Training Program—Army Training Program ZI—1 Apr. 1949.

established in appropriate Army directives, including the functions of the Theater Psychiatrist, Army Psychiatrist, Division Psychiatrist, Training Center Psychiatrist, and Disciplinary Barracks Psychiatrist. We have a consultant in psychiatry assigned on a theater level in the Far East. We have no Army psychiatrists assigned either to field Armies or Army areas in the continental United States but we do have division psychiatrists in each active overseas combat division. A mental hygiene clinic has been established in each of our 9 basic training centers (there were 33 during World War II) and there are adequate staffs in each of our 3 disciplinary barracks. In our hospital services, psychiatry has been established as a service comparable to medicine and surgery wherever the numbers of patients so warrant and local definitive treatment is given as far as the professional capacity of the staff permits.

REPORTS

One of the great defects in the past has been the lack of effective communication on psychiatric problems from field medical units and between responsible staff officers in the different echelons of command. When necessary, Army regulations permit more or less direct communication on technical matters *(10)*. In addition periodic reports such as the Essential Technical Medical Data Reports *(11)*, monthly reports from the Mental Hygiene Consultation Services *(5)*, and monthly reports from the Psychiatry and Sociology Division in Disciplinary Barracks *(12)* are received from field commands.

CLASSIFICATION AND ASSIGNMENT OF NEUROPSYCHIATRIC PERSONNEL

Whereas during World War II we had military occupational specialty (MOS) numbers only for neuropsychiatrists and later on psychologists, we now have MOS numbers also for the electroencephalographer, the neurologist, psychiatrist, psychiatric social worker, psychiatric nurse, and male and WAC *(13) (14)* enlisted specialists such as neuropsychiatric technician, psychologic technician, psychiatric social work technician, and electroencephalographic technician. There are 31 enlisted career fields (Army wide), of which the medical is only one, and there are 33 enlisted medical specialties. School courses in military psychiatry and in the other medical occupational specialties are either in operation or are being maintained on a standby basis at Brooke Army Medical Center.

(10) AR 340-15, July 1950, Correspondence and Mail.

(11) SR 40-1005-1, Sept. 1949, Medical Service—Essential Medical Data Report.

(12) SR 600-395-10, Mar. 1949, Personnel—Monthly Statistical Report of Disciplinary Barracks.

(13) SR 615-25-36, Nov. 1950, Enlisted Personnel—WAC MOS Assignment, and SR 615-25-15, Nov. 1950, Enlisted Personnel—Military Occupational Specialties.

(14) SR 615-25-20, Nov. 1950, Enlisted Personnel—Career Fields.

COMBAT

Whereas we began World War II with no specific plan for the care of neuropsychiatric casualties we now have definite plans and directives *(15) (16) (17) (18)* to enable us to treat neuropsychiatric combat casualties effectively and thereby prevent excessive losses in manpower. Principles employed are (a) treatment as far forward as possible; (b) centralization of screening, treatment, and evacuation; and (c) treatment under other than a hospital atmosphere. In combat areas the formation of special treatment units by the use of mobile psychiatric *(16)* teams attached to clearing companies or numbered hospitals as indicated is authorized. The principles of combat psychiatry, treatment of combat casualties, and the legal aspects of psychiatry in military law *(19)* have all been published in appropriate Army publications.

PSYCHOLOGY

Clinical psychology has been firmly established in the Army Medical Service as a branch in the Psychiatry and Neurology Consultants Division. Procurement is proceeding satisfactorily under the terms of the senior psychology student program *(20)* whereby Army internships with a later period of obligated service are offered to those pursuing Doctorate degrees in universities.

SOCIAL WORK

Since the end of World War II psychiatric social work has been formally established as a specialty in the Army Medical Service and as a branch of the Psychiatry and Neurology Consultants Division. Officer procurement is proceeding satisfactorily under the terms of a graduate social work student program *(21)* whereby recent graduates in psychiatric social work take a competive year's tour of duty with the Army. Lately the program has been expanded to include all social casework services for all Army medical installations and the branch has been redesignated as the Social Services Branch.

PSYCHIATRY AND NEUROLOGY

With the demobilization incident to World War II few trained psychiatrists or neurologists remained on duty in the Army. Approved residency training programs *(22) (23)* were established in military

(15) Combat Psychiatry. Bull. U. S. Army M. Dept. (supp.). p. 216, Nov. 1949.

(16) Neuropsychiatric Casualties; Handling in Theater of Operations, TC 6, Apr. 1950.

(17) Ranson, S. W.: Psychiatric treatment in combat areas. U. S. Armed Forces M. J. 1: 1379-1397, Dec. 1950.

(18) T/O&E 8-500, Mar. 1950, Medical Service Organization, Dept. Army.

(19) TM 8-240, Sept. 1950, Psychiatry in Military Law.

(20) SR 605-60-40, May 1949, Officers—Senior Psychology Student Program.

(21) SR 605-60-42, Sept. 1949, Officers—Graduate Social Work Student Program.

(22) SR 605-60-43, Jan. 1950, Officers—Medical Officer Procurement, Professional Training Programs.

(23) SGO Cir. No. 9, Jan. 1951, Medical Service Graduate Professional Education Program.

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hospitals and officers were assigned to designated civilian hospitals for residency training. In this manner well over 100 additional officers with psychiatric training have been secured for service in the Army. Without this training and without the services of these officers, the high quality of medical service that has been rendered in the last few months would have been impossible. We have 16 or more Regular Army officers certified in psychiatry or in neurology, or both.

INDUCTION

In general, physical and mental (psychiatric) standards have been lowered to include personnel formally designated as limited service (24) (25). Inasmuch as there are now no formal limited service categories this has led to certain difficulties in the classification and assignment of men. Physical standards for a Reserve commission in the Army Medical Service have been lowered to equal those for enlisted personnel to avoid the possibility of physicians being inducted on an enlisted level but not being eligible for a commissioned status. Intelligence requirements for induction have, however, been set at a higher level than that prevailing in World War II. In part, this has been caused by the desire to create (1) a cadre or training Army and (2) because in the Army the incidence of delinquency and of venereal disease occur in inverse ratio to intelligence levels. It is believed that any pressure to accept large numbers of substandard personnel should be exerted across the board to include all the Armed Services and not be directed solely at the Army.

SEPARATION

In former years those who were unable to perform military service were largely separated through medical channels. During and since World War II increased recognition has been given to other factors contributing to inability to perform satisfactory service such as motivation, morale, and emotional and personality disorders, all of which contribute to ineffectiveness, and may be more properly handled through administrative procedures (26) (27) (28) (29) (30) (31) (32). Physical qualifica-

(24) AR 40-115, Aug. 1948, Medical Service—Physical Standards and Physical Profiling for Enlistment and Induction.

(25) AR 40-100, Jan. 1951, Medical Service—Standards of Miscellaneous Physical Examinations.

(26) AR 615-364, June 1950, Enlisted Personnel—Discharge; Dishonorable and Bad Conduct.

(27) AR 615-366, Oct. 1949, Enlisted Personnel—Discharge; Misconduct.

(28) AR 615-368, Oct. 1948, Enlisted Personnel—Discharge; Unfitness.

(29) AR 615-369, Oct. 1948, Enlisted Personnel—Discharge; Inaptitude or Unsuitability.

(30) AR 615-370, Dec. 1950, Enlisted Personnel—Discharge; Disloyal or Subversive.

(31) AR 600-443, 12 Jan. 1950, Personnel—Separation of Homosexuals.

(32) AR 605-200, Jan 1951 and Memo 605-200-1, 24 Jan. 1951, Officers—Demotion and Elimination.

tions for retention on active duty are liberally interpreted (33) (34) (35) (36). Persons may be retained provided that such diseases, injuries, or infirmities are (1) of such a nature and degree as not to affect adversely the performance of continued active duty considering the soldier's age, grade, branch, and normal duties and (2) not subject to complications or serious aggravation by reason of continued active duty. Thus no disorder by name is an absolute bar to continued military duty. Consequently, the number of administrative separations has increased markedly and the rate for medical separations has been below normal expectancies. The noneffective rate for illness has been lower in the last few years than at any other time in the Army's history. Of marked benefit too has been the change in retirement laws, whereby both officer and enlisted personnel can be retired on percentage of disability—rather than at a fixed percentage of pay.

PREVENTIVE PSYCHIATRY

Much greater emphasis has been given to intensive treatment for mental disorders, and emotional and personality problems, through mental hygiene clinics, outpatient services, and individual treatment based on dynamic psychiatry. The services of a diagnostic treatment team have been used wherever possible employing the services of psychiatrists, clinical psychologists, psychiatric social workers, and psychiatric nurses as well as occupational therapists, physical therapists, and others trained in technics of rehabilitation. On the other hand, increased recognition has been given to the influence of social factors in the production of mental illness, with specific attention to the stresses and supports (37) (38) (39) that are encountered in the military service. Factors especially considered are combat, the environment, physical hardships, proper classification and assignment, training systems, replacement systems, the rotation system, domestic situations, personnel policies that emphasize the importance of the individual (40), leadership, unit and group identifications, religious influences, orientation, education in mental health, attitudes, incentives, and motivations.

USE OF MEDICAL PERSONNEL

The training program undertaken by the Army was designed to meet specialist requirements within a 10-year period. In the interim, various

(33) AR 600-450, 7 Nov. 1949, Personnel—Separation for Physical Disability.

(34) SR 600-450-1, 7 Nov. 1949, Personnel—Physical Evaluation, Hospitalization, Disposition, and Separation for Physical Reasons.

(35) SR 615-360-40, 25 Aug. 1950, Enlisted Personnel—Disposition of Individuals with Physical or Mental Disability, EPTE.

(36) SR 600-440-1, 7 June 1949, Personnel—Disposition of the Psychotic.

(37) AR 15-120, 30 July 1950, Boards, Commissions and Committees—Character Guidance.

(38) AR 355-20, 23 Jan. 1951, Troop Information and Education—Troop Information Program.

(39) AR 355-5, 23 Jan. 1951, Troop Information and Education—General Provisions.

(40) Statement of Military Personnel Policy, Section III, Bulletin No. 4, Department of the Army, 14 March 1950.

measures have been used to overcome specialist shortages as well as to maintain a close relationship between military and civilian practice. To this end, the civilian consultant system has been used to overcome specialist shortages as well as to maintain a close relationship between military and civilian practice. Under emergency conditions in which the needs of the Army become vastly greater, an expansion of the consultant system helps but does not fully satisfy the need. The Organized and Active Reserve was designed to fill the needs of the Army for increased personnel in time of emergency. For various reasons this personnel has not been readily available in the last several months. A reorganization of the entire Reserve program is currently under study.

SUMMARY

In the last few years a flexible organizational structure for neuropsychiatric services in the Army has been largely completed by translating concepts evolved during World War II into firm Army doctrine and directives. The main problem before us at present is the procurement, training, and effective use of personnel.

Mirror Laryngoscopy.

Harry R. Morse, *Lieutenant, junior grade, MC, U. S. N. R. (1)*

MANY patients with laryngeal complaints who have never had their larynx visualized or who have not had the procedure early enough are seen. Although the examination of the larynx with a mirror is a simple procedure which requires little time, it is often neglected. Any physician can make a competent laryngeal examination with a little practice. With the apparent increasing incidence of carcinoma of the larynx *(2)* and the possibility of cure with early diagnosis, mirror laryngoscopy should be more commonly used by all physicians, especially general practitioners.

The correct technic is discussed in most of the textbooks on otolaryngology. Jackson and Jackson *(3)* call attention to such pitfalls as failure to: (1) make a thorough examination; (2) develop a routine so that no significant findings will be overlooked; (3) realize that the larynx of any patient of any age, whose mouth can be opened, can be visualized; and (4) visualize the anterior commissure. By adhering to the rules listed in the next paragraph, visualization of the anterior commissure is possible, but in a small number of subjects an epiglottic retractor may be needed.

The following requirements must be met:

(1) The patient should be seated well back in the chair with the head and shoulders forward and the chin extended (figs. 1 and 2).

(2) A mirror which is small enough to fit between the tonsils without touching them, thus decreasing the patient's tendency to gag, should be used.

(3) The mirror should be warmed to body temperature before use. It may be held either in the examiner's right or left hand.

(4) The tongue should be grasped between the thumb and third finger with a folded piece of gauze, the thumb being on the upper surface of

(1) U. S. Naval Hospital, National Naval Medical Center, Bethesda, Md.

(2) Jackson, C., and Jackson, C. L.: Diseases and Injuries of the Larynx. 2d edition, revised. The Macmillan Co., New York, N. Y., 1943.

(3) Jackson, C., and Jackson, C. L.: Diseases of the Nose, Throat, and Ear. W. B. Saunders Co., Philadelphia, Pa., 1945.

Figure 1.—The correct position for examination.

the tongue, thus liberating the index finger to hold the upper lip out of the way.

(5) Gagging should be controlled by asking the subject to breathe deeply through the mouth. If this does not suffice a small amount of a local anesthetic may be sprayed on the posterior pharyngeal wall. Either 2 percent pontocaine or 4 percent cocaine is effective and quite safe.

(6) Having the patient phonate will often aid in obtaining a better or a more complete view.

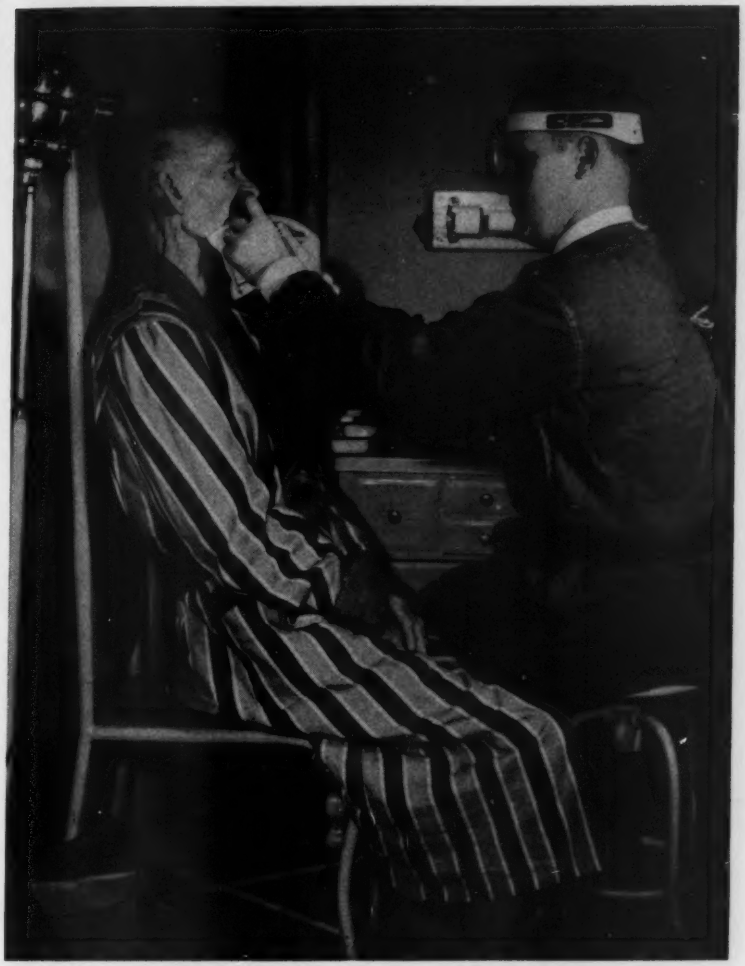

Figure 2.—Incorrect position for examination.

By observing the above principles examination of the larynx will be easy. Many physicians fail to make mirror examinations because they have not developed dexterity with the head mirror. To obviate this difficulty, mirrors with a built-in light source are available. I have recently devised such a mirror with medium-sized flashlight batteries contained in the handle (fig. 3). This has proved to be convenient for examination of the larynx and also quite practical not only when the examiner lacks skill with the head mirror, but also for use in the home, at the bedside, or when carrying out special procedures requiring topical anesthesia of

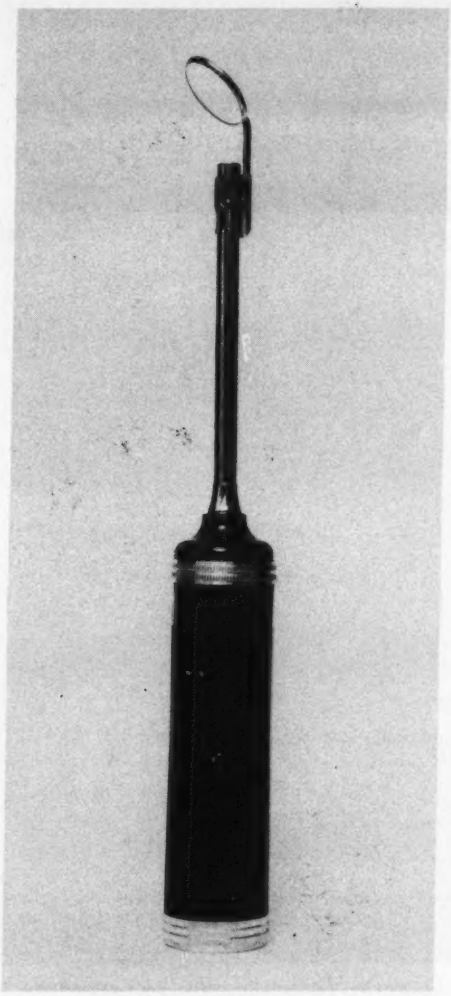

Figure 3.—Portable laryngeal mirror with batteries contained in the handle.

the larynx, as in bedside intubations, bronchoscopies, and lipiodol bronchographies. The mirror can be easily and quickly removed from the post and sterilized by boiling. The battery handle can be unscrewed to permit cold-sterilization of the rest of the instrument.

Method for Dental Technician Candidate Selection

The Value of the Intelligence Quotient and Practical Aptitude Tests as an Accurate Index of Potential Abilities

Curtiss W. Schantz, *Captain, DC, U. S. N.* (1)

DURING the current year, 20 million elementary school children will be subjected to some form of intelligence test to determine their intelligence quotient (I. Q.). In little more than a generation, the influence of intelligence tests has risen to a new height and has become empirical in the field of education as a yardstick to determine when a child should read, whether another should go to college, and if a third would grow up to be a dolt or an Einstein. This manner of testing intelligence has spread into practically all fields of education, including the Armed Forces service schools. In theory, intelligence tests are sound. Because intelligence is the faculty used by human beings to perform tasks motivated by the mind, it is assumed that intelligence tests can measure that faculty in an individual. And yet, while thousands of educators continue to apportion the attention allotted a pupil in accordance with the score made by him in a 45-minute written examination, more and more practical educators are beginning to doubt the infallibility of such tests.

In the case of dental technicians, field observation of students whose I. Q. had not been very high at the beginning of training periods, has reversed the popular opinion that such students would always make inept or stupid technicians. The fault may lie in the type and scope of the usual tests which, in only a few instances, measure potential aptitude. Records of dental technicians, covering the experience of 2 years and including case histories of 400 men and women, revealed that when certain factors were considered, weighed, and evaluated in determining aptitude and intelligence, the usual intelligence tests proved to be inadequate. The factors which proved to be most valuable in testing technician applicants, were: (1) personality, (2) character, (3) social

(1) U. S. Naval Dental Technicians School, U. S. Naval Training Station, Great Lakes, Ill.

attitude, (4) physical development, (5) common sense, (6) ability to find facts and to apply them for practical purposes, and (7) experience (and education).

The prevailing tendency of all intelligence tests devised to date, does not consider the economic and social group from which the student comes. Instead, the average grade made by an average group has already established the "normal level" of all persons who later take such a test. The result, assessed on such a basis, invariably places the student with an I. Q. above the average in a higher bracket, when, in reality, such a rating may have been the result of greater advantages in economic and social background rather than higher intelligence. As a specific example, one problem in a popular test requires that the student know the meaning of the word "sonata." Among students from higher socioeconomic groups, 78 percent gave the correct answer while only 28 percent of students of the same age group from lower groups answered it correctly. That is a matter of education and experience rather than of intelligence.

In the selection of dental technicians, the basic requirement is a minimum of 2 years of high school or its equivalent. A more desirable prerequisite is 4 years of high school because these candidates are better grounded in elementary sciences, and have learned to study and can be more easily motivated. In selecting students with the minimum requirements as well as those with higher educational qualifications, some consideration of their experience in the dental field is given. The applicant who offers equivalent experience in lieu of high school training (1) is acutely conscious of difficulties in expression, especially expression in writing, (2) has finger skill and co-ordination but does not make a good typist, and (3) has a strong desire to overcome his lack of education. The selected students begin their instruction with varied native abilities. This imposes on the instructor the task of providing assimilable instruction to each of the students regardless of his educational background. To offset known shortcomings among instructors in their ability to project and properly motivate students, an intensive in-service training course was undertaken among the instructors. In order fully to qualify the instructor and to preclude any lack of ability on his part to provide all students with the same assimilable material, a highly qualified monitor and instructor provided for this in-service program audited all instructors' classroom work. Despite the correction of obvious shortcomings of the instructors, failures among the students selected remained at the same level (6 percent). This did not necessarily indicate that no value was derived from the instructor in-service training, but rather that the methods of evaluating student applicants' abilities were still faulty, particularly from the standpoint of the instructor. Based on this conclusion, it was deemed desirable to apply a pilot aptitude test for the student in addition to the present minimum and maximum admission requirements.

The test was devised in order to provide the instructors with an index to the student's known abilities. Additional factors were sought for immediate potential progress evaluation. It was desired to know whether the student: (1) could read correctly and follow written instructions, (2) could apply written instructions and correctly interpret them as related to a blueprint, (3) possessed manual dexterity, (4) was unduly emotional, and (5) reacted quickly to stimuli.

The following instructions were given each candidate with the necessary visual aids and instruments:

APTITUDE TEST FOR DENTAL TECHNICIANS
(DEXTERITY TEST)

Read These Instructions Carefully:

You have been supplied with one piece of chalk which is 4 inches long and 1 inch in diameter. One end, it will be noted, is flat and the other end is cone-shaped.

You further are supplied with a pencil, ruler, plaster knife, and a file. With these tools you are to carve two kinds of figures, a half sphere and a triangle, as denoted in the attached blueprint.

It is most important that you follow the directions for each carving very carefully. You should do as neat work as possible for you will be graded on such points as:

1. Degree to which your surfaces are flat and smooth.
2. Degree to which angles are clean-cut.
3. Degree to which rounded surfaces are symmetrical.
4. Similarity of finished object to the blueprint and description, or accuracy of reproduction.

No deduction from grade will be made if the finished carving possesses pencil marks but the carving should NOT be marked or marred with knife cuts to designate dimensions, etc.

Suggestions:

Your knife is very sharp and if you handle the knife properly you will note that you can slice the chalk easily in the direction you draw the blade, leaving a smooth glasslike surface. A slight angle on the blade as desired may be regulated by your grip on the knife handle. The grip applied to the knife handle should exclude the thumb. The thumb serves best as a guide to the surface being carved and as fulcrum for control.

You can use the file for outline shaping with the ruler to test accuracy of measurements and flatness of surface by placing the ruler on the carved surface in several positions.

It is important to remember that inasmuch as this is an aptitude test for dexterity and carving, use only the tools provided. You are not to use sandpaper or attempt to use bench surfaces or your hands to smooth the chalk.

All illustrations have been drawn to scale and all dimensions are indicated. Follow directions carefully and remember you will be graded according to your result rather than reproduction of the scale of the carving.

You are allowed 45 minutes to complete your test. Try NOT to take longer than 45 minutes.

Completion Procedure:

1. Write your name and service number on your carving in pencil.
2. Hand in your finished carving to your examination proctor.
3. Results of this examination will be forwarded to you within 10 days via your commanding officer.

With the above instructions each student was supplied with a blueprint of his project as a visual aid and a guide for shape and dimensions (fig. 1).

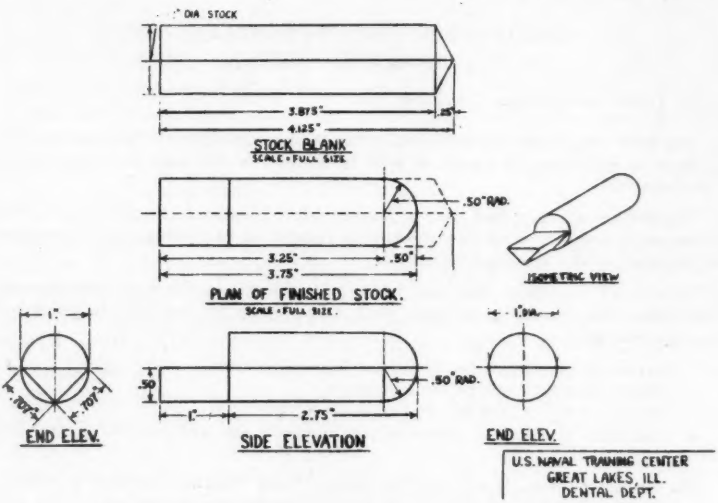

Figure 1.—Blueprint furnished with written instructions.

RESULTS

As a result of this test the students were rated as outstanding, average (will develop), and below average (may develop but will require longer period of instruction). Figure 2 shows an example of outstanding and below average aptitude. The student constructing the below average carving failed the prescribed course. To check the development of all dental technicians after their graduation, 6-month individual aptitude check sheets were devised and forwarded to field activities. The returned check sheets were then checked against the pilot tests. Evaluation of the progress of 200 graduates indicated that early estimates made by means of the pilot tests were most accurate and helpful in selecting the most apt candidates for dental technician rate. Invariably, the graduate from the "average" group improved and, in the judgment of the dental officer who has had an opportunity to observe the practical application of the technician's assessed qualities, the graduate of this group is qualified to advance in rate.

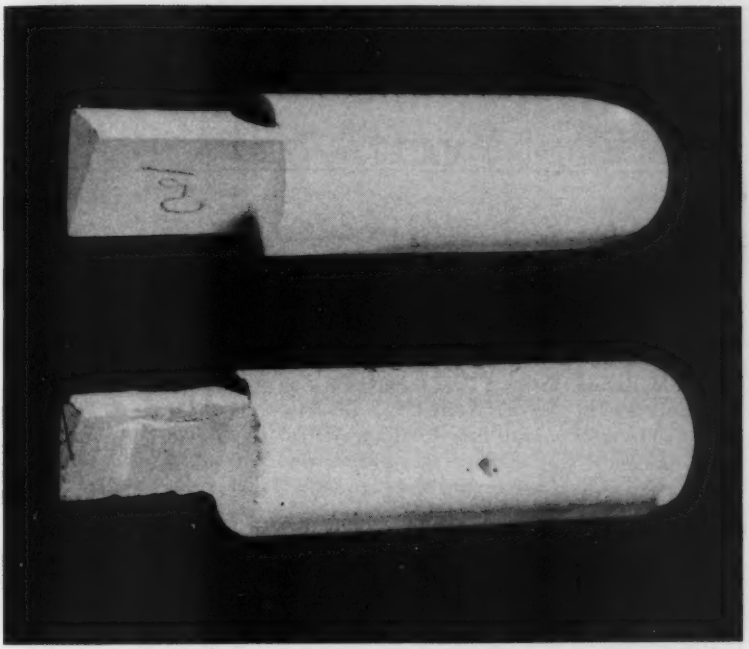

Figure 2.—Student submitting upper carving was rated outstanding; lower carving, below average.

CONCLUSIONS

The figures compiled and the facts indicated by the foregoing findings would appear to prove that present methods of evaluation of a candidate's aptitude are inadequate and that additional methods are both desirable and necessary. They would be of particular value where in a curriculum of limited time attempts are being made to adjust differences in natural ability, education, socioeconomic background and varying experience to give an equal chance to all students.

Residency Information Service

The Council on Medical Education and Hospitals of the American Medical Association is sponsoring a Residency Information Service. A statement concerning this service appears in the 21 April 1951 issue of the Journal of the American Medical Association. All hospitals approved for residency training are being asked to furnish information periodically concerning the residencies offered by them. This information is to be compiled, revised monthly, and made available to any prospective applicant on request, beginning on or about 1 May 1951.

—*The Editors.*

About the Army Medical Service

Procurement of Medical Officers

Paul I. Robinson, *Brigadier General, MC, U. S. A.* (1)

THE ideal Regular Army prospect is the capable, efficient Reserve officer on active duty whose ambitions are recognized, whose assignment is proper, whose efforts are appreciated, and whose welfare is protected. A person under these conditions is generally happy at work. The responsibility for bringing about these conditions is not that of the commanding officer nor that of the personnel officer alone. It is the apparent responsibility of every Regular Army officer, regardless of his position or assignment. When an officer is working under the above conditions, he is happy and his morale is high.

High morale may be said to be the reflection of the success of an individual's superior officer in fulfilling his leadership responsibilities. High morale knows no class segregation, it has no bias or prejudice based on false standards of civilization; it arises from a person's feelings of acceptance and of "belongingness" in a group. It stems from efficiency, from consideration and human relations, and from the feeling of equity.

The pattern of equity and equality within a group does not exclude us from the fact that we may feel that we, as individuals, belong to another exclusive group which may be part or parcel of a smaller or larger group. For example, we may sit around a table and discuss medicine, each one in the group coming from a different university. We all have a share within the discussion of the matter of medicine; however, one may feel that he came from a superior medical school. Though one may feel that the standards of other medical schools were not up to those of the school which he attended, this does not in any way exclude him from equity within the group. This metaphor may be applied to the Army. We in the Regular Army feel that we belong to a group, but this does not exclude us from equity with any other member of the military service.

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(1) Chief, Personnel Division, Office of the Surgeon General, Department of the Army.

We in the Regular Service do, however, have the responsibility of telling others of our organization what we feel to be the benefits of a Regular Army career. On the other hand, we should not enforce such an attitude upon the person who has reasons for manifesting no interest whatsoever in the Regular Army Medical Service.

We now have a procurement goal of approximately 700 officers for the Regular Army Medical Corps. Slightly over 700 officers have been selected for the Regular Army in the past 30 months, an average of 23 a month. This number in itself does not appear to be large; however, when it is considered that the selection is based upon a highly competitive process, it may be understood that the 700 officers selected make a highly impressive figure. Goals for other Regular Corps in the Army Medical Service are Dental Corps 120, Medical Service Corps 225, Women's Medical Specialist Corps 240, and the Army Nurse Corps about 1,500. The Veterinary Corps is up to strength at the present time.

Our particular interest in personnel today must be the procurement of officers who vitalize and enrich our Regular Army Medical Service. Reserve officers on active duty at the time of application for Regular Army status simply complete the necessary forms and forward them to the Army Surgeon General through their Commanding Officers. If the applicant is in a civilian status, he completes the necessary forms and sends them to named Army Hospital *(2)* nearest his residence. The application forms may be obtained by writing to the Army Surgeon General, Washington 25, D. C., or the Commanding Officer of any of the named Army hospitals *(2)*.

Qualitatively, we believe that we have within the Regular Army Corps of the Medical Service the finest possible cross-section of medical personnel of our nation. Our immediate and future problem is to maintain high standards in the interest of the Army and the officers who now comprise the Corps.

Adequate machinery now exists for the integration of nonregular component Medical Service officers into the Regular Army. There are, of course, areas to be improved and constant efforts toward improvement will continue. We are relying on every Regular Army officer to assist in the procurement of personnel to fill the existing vacancies in the Regular Army Medical Service.

The professional, social, and financial benefits of the service are now well recognized and may be truthfully exploited.

One phase of military service which has in the past had little, if any, recognition is that of research and development within the field of medicine and in the field of the sciences allied to medicine. The

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(2) Hospitals such as Letterman, Fitzsimons, Walter Reed, et cetera which are under the jurisdiction of the Office of the Surgeon General, as differentiated from U. S. Army Hospitals (Class I installations) under the jurisdiction of the Commanding Officer of the post on which located.

great increase in the number of articles being published by members of the service give evidence of the freedom of thought, the freedom of speech, and the general democratic attitude throughout the service at the present time. Hardly a professional journal can be picked up today which does not have an article published by some member of the Army Medical Service. These articles range from subjects relative to atomic research to articles published in the field of research in personnel matters. Papers are being read by members of the Army Medical Service at many professional association meetings and conferences which is evidence of the proficiency of our Corps.

On all sides the general public is learning that the Army Medical Service is not made up of hard-boiled, rigid dictators, but that it is comprised of those with free endeavor and free thought. This attitude is the result of well-planned and well-executed policies throughout the Office of The Surgeon General and the members of the Corps. In an article published in the Bulletin of the U. S. Army Medical Department, June 1949, the following observation was made: "We are proceeding slowly but satisfactorily with our long range regular officer procurement for the Medical Department." This statement is as true today as it was 2 years ago.

Many Reserve officers who will be on duty during the next few years will find that they have real interest in a career with the Army Medical Service. After all, there are not too many vacancies, but commissions in the Regular service will remain open so long as vacancies do exist. Those who are interested must be encouraged to investigate further an Army career. Correspondence with this office should always be encouraged if the answers are not available at the station. After commissioning in the Regular service, officers are eligible for competitive appointments in residency programs and in many other training programs in a wide field of endeavor in the Medical Service.

Our goal is to make appointments to fill the vacancies in the various Corps of the Army Medical Service from applicants who have sincere interest and who have qualities of judgment, leadership, and ability which are necessary to maintain the traditions of the service, but at the same time lead it to greater and progressive accomplishments.

A Proposed New Feature

Listing of Articles Published in Other Journals by Personnel of the Medical Services of the Armed Forces

If a sufficient number of personnel of the Medical Services of the Army, Navy, and Air Force show an interest in furnishing information concerning articles which they have had published in other journals, this section will be made a permanent feature of the *Armed Forces Medical Journal.* Please give (1) the title of the article; (2) the names and ranks or rates of the authors; and (3) the name, volume and page numbers, and date of the issue of the journal in which the article was published.

—*The Editors.*

BOOKS RECEIVED

Medical Psychology, A Basis for Psychiatry and Clinical Psychology, by *G. K. Yacorzynski,* Ph. D., Associate Professor of Nervous and Mental Diseases, Northwestern University Medical School. 535 pages; illustrated. The Ronald Press Co., New York, publishers, 1951. Price $6.

Recovery from Aphasia, by *Joseph M. Wepman,* Ph. D., Clinical Instructor in Otolaryngology (Speech Pathology) and Lecturer in Psychology, The University of Chicago; with a foreward by *Wendell Johnson,* Director of the Speech Clinic, State University of Iowa. 276 pages; illustrated. The Ronald Press Co., New York, publishers, 1951. Price $4.50.

Bases of Human Behavior, A Biologic Approach to Psychiatry, by *Leon J. Saul,* M. D., Professor of Clinical Psychiatry, University of Pennsylvania School of Medicine; Psychiatric Consultant, Swarthmore College; Lecturer, Bryn Mawr College. 150 pages; illustrated. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1951. Price $4.

Know Your Teeth, A General Review of Everyday Questions (with Answers) asked Daily by Dental Patients, by *Walter Neal Gallagher,* D. D. S., Graduate of the School of Dentistry of Temple University, Phila., Pa., Class of 1935; Intern at Forsyth Dental Infirmary for Children, Boston, Mass.; Intern at the Temple University Hospital, Phila., Pa.; Extern at Hahnemann Hospital, Phila., Pa.; Practiced General Dentistry, Hazleton, Pa., 1936–1942; Member of the United States Naval Dental Corps; Member of the American Dental Association; Author of Complete Dental Review. 81 pages; illustrated. Exposition Press, New York, publishers, 1950. Price $2.

Cornell Conferences on Therapy, Volume IV, edited by *Harry Gold,* M. D., Managing Editor, *David P. Barr,* M. D., *McKeen Cattell,* M. D., *Frank Glenn,* M. D., *Walter Modell,* M. D., and *George Reader,* M. D. 342 pages. The Macmillan Co., New York, publishers, 1951. Price $3.50.

Recent Advances in Chemotherapy, Volume II, by *G. M. Findlay,* C. B. E., Sc. D., M. D., F. R. C. P.; Editor, Abstracts of World Medicine and Abstracts of World Surgery, Gynaecology and Obstetrics, British Medical Association, London. 3d edition. 597 pages; illustrated. The Blakiston Co., Philadelphia, Pa., publishers, 1951. Price $7.50.

Handbook of Antibiotics, by *A. L. Baron.* 303 pages. Reinhold Publishing Corp., New York, N. Y., publishers, 1950. Price $6.50.

Hemodynamics in Failure of the Circulation, by *W. B. Youmans,* M. D., Ph. D., Professor of Physiology, Department of Physiology, University of Oregon Medical School, Portland, Oreg., and *A. R. Huckins,* M. S., M. D., Research Assistant, Department of Physiology, University of Oregon Medical School, Portland, Oreg. 71 pages; illustrated. Publication Number 88; American Lecture Series. Charles C Thomas, Publisher, Springfield, Ill., 1951. Price $2.75.

Orthopaedic Nursing, by *Frederick J. Knocke*, M. D., Adjunct Orthopaedist, Lenox Hill Hospital; Attending Orthopaedic Surgeon, Institute for the Crippled and Disabled; Instructor in Orthopaedic Surgery, Columbia University, New York; Diplomate, American Board of Orthopaedic Surgery, and *Lazelle S. Knocke*, R. N., B. S., Formerly Head Nurse, Women's Surgical Ward, Lenox Hill Hospital; Clinical Instructor in Orthopaedic Nursing; Hospital for Special Surgery; Instructor (part time) in Nursing Education, Teachers College, Columbia University, New York. 682 pages; 312 illustrations. F. A. Davis Co., Philadelphia, Pa., publishers, 1951. Price $5.

Hospital Staff and Office Manual, by *T. M. Larkowski*, M. D., F. A. C. S., Professor of Clinical Surgery, Stritch School of Medicine, Loyola University, Chicago, Ill.; and *A. R. Rosanova*, R. Ph., M. D., Clinical Instructor, University of Illinois Medical School, Chicago, Ill. 428 pages; illustrated. Romaine Pierson Publishers, Inc., Great Neck, N. Y., publishers, 1951. Price $5.

Dimensional Analysis for Students of Medicine, by *Harold A. Abramson*, M. D., Assistant Clinical Professor of Physiology, Columbia University; Associate Physician and Chief Allergy Clinic, The Mt. Sinai Hospital, New York City; Consultant (Psychology), Department of the Army. 41 pages. The Josiah Macy, Jr. Foundation, New York, N. Y., publishers, 1950. Price $1.

Hypnotherapy of War Neuroses, A Clinical Psychologist's Casebook, by *John G. Watkins*, Ph. D., Associate Professor of Psychology, State College of Washington; formerly Chief Clinical Psychologist, Welch Convalescent Hospital, Daytona Beach, Fla. 384 pages; illustrated. The Ronald Press Co., New York, N. Y., publishers, 1949. Price $5.

Physical Examination in Health and Disease, by *Rudolph H. Kampmeier*, A. B., M. D., Associate Professor of Medicine, Vanderbilt University School of Medicine; Visiting Physician to Vanderbilt University Hospital; Chief of the Medical Outpatient Service, Vanderbilt University Hospital, Nashville, Tenn. 821 pages; with 550 illustrations, 1 in Color. F. A. Davis Company, Philadelphia, Pa., publishers, 1950. Price $8.

A Handbook of Space Flight, by *Wayne Proell*, Editor, Journal of Space Flight, and *Norman J. Bowman*, Ph. D., Editor, Rocket Abstracts. 185 pages. Perastadion Press, Chicago, Ill., publishers, 1950. Price $3.50.

Handbook of Diagnosis and Treatment of Venereal Diseases, by *A. E. W. McLachlan*, M. B., CH. B. (Edin.), D. P. H., F. R. S. (Edin.), Consultant in Venereal Diseases, Bristol Clinical Area; Lecturer in Venereal Diseases, University of Bristol; Honorary Consultant in Venereal Diseases, Bristol General Hospital; formerly Clinical Medical Officer, Joint Committee's Clinic, Newcastle General Hospital, Newcastle upon Tyne; Lecture in Venereal Diseases, King's College, University of Durham; Assistant Medical Officer, Venereal Diseases Department, West London Hospital; Clinical Tutor in Venereal Diseases, University of Edinburgh, etc. 4th edition. 368 pages, with 160 illustrations; 20 in color. The Williams and Wilkins Co., Baltimore, Md., publishers, 1951. Price $4.50.

Somatic and Psychiatric Treatment of Asthma, edited by *Harold A. Abramson*, M. D., Associate Physician and Chief, Allergy Clinic, The Mount Sinai Hospital, New York; Assistant Professor of Physiology, The College of Physicians and Surgeons, Columbia University. 751 pages; illustrated. The Williams and Wilkins Co., Baltimore, Md., publishers, 1951. Price $11.

The Doctor, His Career; His Business; His Human Relations, by *Stanley R. Truman*, M. D. 151 pages. The Williams & Wilkins Co., Baltimore, Md., publishers, 1951. Price $3.

Psychological Factors of Peace and War, edited by *T. H. Pear*. Contributions by *G. W. Allport, J. Cohen, H. V. Dicks, H. J. Eysenck, J. C. Flugel, Hilde Himmelweit, Madeline Kerr, T. H. Pear, L. F. Richardson*. 262 pages. The Philosophical Library, Inc., New York, N. Y., publishers, 1950. Price $4.75.

The 1950 Year Book of Orthopedics and Traumatic Surgery (November 1949–November 1950), edited by *Edward L. Compere*, M. D., F. A. C. S., Associate Professor of Bone and Joint Surgery, Northwestern University Medical School; Chairman, Departments of Orthopedic Surgery, Wesley Memorial and Children's Memorial Hospitals; Consultant Orthopedic Surgeon, Chicago Memorial Hospital; Consultant in Orthopedics, U. S. Naval Hospital, Great Lakes, Ill. 388 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill,, publishers, 1950. Price $5.

Cancer as I See It, by *Henry W. Abelmann*, M. D. 100 pages. Philosophical Library, Inc., New York, N. Y., publishers, 1951. Price $2.75.

Homicide Investigation, Practical Information for Coroners, Police Officers, and Other Investigators, by *LeMoyne Snyder*, Medicolegal Consultant, Lansing, Mich., Member of the American Medical Association, Member of the American Bar Association; with chapters by *Harold Mulbar*, Captain, Michigan State Police, Chief Police Administrator, Public Safety Division General Headquarters, Supreme Commander Allied Powers, Tokyo, Japan; *Charles M. Wilson*, Superintendent, Wisconsin State Crime Laboratory; *C. W. Muehlberger*, Director, Michigan Crime Detection Laboratory. 359 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $7.50.

College Health Knowledge Test, Personal Health-Form A, by *Terry H. Dearborn*, Ed. D., University of California, Santa Barbara College, Santa Barbara, Calif. 11 pages. Stanford University Press, Calif., publishers, 1950. Price, 25 copies, $2.

Psychiatric Aspects of Juvenile Delinquency, A Study prepared on behalf of the World Health Organization as a contribution to the United Nations programme for the prevention of crime and treatment of offenders, by *Lucien Bovet*, M. D., Consultant in Mental Health, World Health Organization, Médecin-chef de l'Office Médico-pédagogique rattaché au Département de Justice et Police de l'Etat de Vaud, Lausanne, Switzerland. 90 pages. Published by World Health Organization, Palais Des Nations, Geneva, 1951. Price $1.

The Education of Nursing Technicians, by *Mildred L. Montag*, Ed. D., R. N., Assistant Professor of Nursing Education, Teachers College, Columbia University; formerly Director, School of Nursing, Adelphi College. Foreword by *R. Louise McManus*, Ph. D., R. N., Professor of Nursing Education and Director, Division of Nursing Education, Teachers College, Columbia University. 146 pages. G. P. Putnam's Sons, New York, publishers, 1951. Price $2.50.

A Synopsis of Surgical Anatomy, by *Alexander Lee McGregor, M. Ch.* (Edin.), F. R. C. S. (Eng.), Senior Surgeon, Johannesburg General Hospital, Lecturer in Surgery, University of the Witwatersrand, with a foreword by *Sir Harold J. Stiles*, K. B. E., F. R. C. S. (Edin.). 7th edition. 778 pages; with 746 illustrations by Dr. E. A. Thomas. The Williams and Wilkins Co., Baltimore, Md., publishers, 1950. Price $6.50.

The 1950 Year Book of Neurology, Psychiatry and Neurosurgery, (November 1949—October 1950), Neurology, edited by *Roland P. Mackay,* M. D., Professor of Neurology, University of Illinois; Attending Neuropsychiatrist, St. Luke's Hospital, Chicago; Psychiatry, edited by *Nolan D. C. Lewis,* M. D., Director, New York State Psychiatric Institute and Hospital; Professor of Psychiatry, Columbia University; Neurosurgery, edited by *Percival Bailey, M.* D., Distinguished Professor of Neurology and Neurological Surgery, University of Illinois. 627 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1951. Price $5.

Virus and Rickettsial Diseases, by *S. P. Bedson,* M. D., F. R. C. P., F. R. S., Professor of Bacteriology, London Hospital; *A. W. Downie,* D. Sc., M. D., Professor of Bacteriology, University of Liverpool; *F. O. MacCallum,* B. Sc., M. D., Director Virus Laboratory, Central Public Health Laboratory; *C. H. Stuart-Harris,* M. D., F. R. C. P., Professor of Medicine, University of Sheffield. 382 pages; illustrated. The Williams & Wilkins Co., Baltimore, Md., publisher, 1950. Price $4.50.

BOOK REVIEWS

Woman's Surgeon, The Life Story of J. Marion Sims, by *Seale Harris,* M. D., with the collaboration of *Frances Williams Browin.* 432 pages; illustrated. The Macmillan Co., New York, N. Y., publishers, 1950. Price $5.

In this biography of Dr. J. Marion Sims, founder of the Woman's Hospital in New York and pioneer gynecologist, whose brilliant achievements carried the fame of American surgery throughout the world, the author has made a thorough search of authentic material and covers Sims' life, from his childhood to his death. The book is interesting, well written, and includes a bibliography.
—*Commander M. A. Godinez, MC, U. S. N.*

The Pharmacopeia of the United States of America (The United States Pharmacopeia), Fourteenth Revision (U. S. P. XIV) and The First U. S. P. XIV Supplement. By authority of the United States Pharmacopoeial Convention, Inc., meeting at Washington, D. C., May 14 and 15, 1940. Prepared by the Committee of Revision and Published by the Board of Trustees. Official from November 1, 1950. 1,066 pages. Mack Publishing Company, Easton, Pa., publishers, 1950. Price $9.

The new revision of the Pharmacopeia of the United States includes an unprecedented total of 204 items not found in previous revisions. Although not all of these are new drugs, most have been developed in recent years and their inclusion reflects the rapid progress being made in the development of therapeutic agents. Some of the new antibiotics included are aureomycin hydrochloride, chloramphenicol, dihydrostreptomycin, streptomycin, and tyrothricin. Two antihistaminic drugs, diphenhydramine hydrochloride (benadryl) and tripelennamine hydrochloride (pyribenzamine), have been listed. Other new admissions are amphetamine sulfate (benzedrine sulfate), calciferol, chloroguanide hydrochloride, chloroquine phosphate, dimercaprol (BAL), heparin sodium, meperidine hydrochloride (demerol hydrochloride) naphazoline hydrochloride (privine hydrochloride), pentylenetetrazol (metrazol), and vitamin B_{12}. On the other hand 119 entries have been dropped from the thirteenth revision. The latest Pharmacopeia serves, as did the earlier editions, as a book of standards for drugs.—*Commander W. P. Briggs, MSC, U. S. N.*

Significance of the Body Fluids in Clinical Medicine, *by L. H. Newburgh,* M. D., Professor of Clinical Investigation, University of Michigan Medical School, Ann Arbor, Mich., assisted by *Alexander Leaf,* M. D., Instructor in Internal Medicine, University of Michigan Medical School, Ann Arbor, Mich. Publication Number 69, American Lecture Series. 76 pages. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $2.

This small, well-bound volume reviews in condensed form, much of our current knowledge of body fluids. The author attempts to increase the understanding of disease by first describing the physiology of the body fluids and then pointing out how this knowledge can assist in the clinical treatment of disease. The information concerning extracellular body fluids, which has been

well studied over a period of several years, as well as the more recent information concerning intracellular fluid, is well summarized. The volume is divided into a section on physiology and one on its clinical significance which outlines the effect of various types of disease on fluid and electrolyte balance. This section also points out the type of therapy which may be used to correct disorders in these components. Particular emphasis is placed in this section on the great importance of potassium deficiency and excess in certain diseases and the value of correcting these abnormalities. This book would be of value to any physician whose patients require adjustment of their fluid or electrolyte balance.—*Commander J. E. Gorman, MC, U. S. N.*

Eyes and Industry, formerly Industrial Ophthalmology, by *Hedwig S. Kuhn*, M. D., Industrial Ophthalmologist, Hammond, Ind. 2d edition. 377 pages; with 151 text illustrations including 3 color plates. The C. V. Mosby Co., St. Louis, Mo., publishers, 1950. Price $8.50.

This second edition continues to be an authoritative treatise by one qualified to speak in industrial ophthalmology. The book is well organized and proceeds in an orderly manner from the initial chapter on visual testing in industry to the final chapters on such special problems as the blind in industry, and epidemic keratoconjunctivitis. Dr. Kuhn has employed an informal style which makes for facile reading. Statistical analyses and charts have been used sparingly and judiciously. Her approach to the many facets of industrial ophthalmology is eminently practical, scientific, and humane, as evidenced by the excellent chapters on eye protection and corrective programs. The section on eye injuries by Dr. Albert C. Snell is an inclusive essay along general lines of value chiefly to the ophthalmologist who is experienced in handling industrial cases. Details of technic and illustrations are omitted from this section. An appendix has been added which includes many useful references, particularly the sections on appraisal of the loss of visual efficiency and standing first-aid orders for nurses treating eye injuries. This book has no parallel in ophthalmology. It will greatly further the industrial ocular hygiene program by serving as a valuable reference and inspiration to the profession.

—*Commander G. L. Tabor, Jr., MC, U. S. N.*

Evaluation of Industrial Disability, Prepared by the *Committee for Standardization of Joint Measurements in Industrial Injury Cases of the California Medical Association and Industrial Accident Commission, State of California.* 89 pages; illustrated. Oxford University Press, New York, N. Y., publishers, 1950. Price $4.

This book represents the work of a committee authorized by the Council of the California Medical Association to develop standardized methods for evaluating and reporting joint motion restrictions resulting from industrial injury. Except for brief general instructions, the book is entirely devoted to the methods of measuring and reporting individual joint motions. The material is so arranged that the text page faces the page with the illustrating photodiagram. The range of an individual joint motion is recorded as a fraction of the motion present in the corresponding joint on the opposite side. For example, if the range of abduction of the uninjured shoulder is 175°, and the range of the injured side is 130°, the shoulder abduction is reported as: Shoulder abduction 130/175. Proper use of this book should simplify disability evaluation so that special training is not required to make a satisfactory report. This book is a "workshop or laboratory manual" with concise, clear-cut instructions. It will be an excellent adjunct to the library of anyone concerned with making a physical disability evaluation of joint motion restrictions resulting from injury and will be of great aid in assisting the industrial surgeon in applying the principles of selective placement of the disabled worker.

—*Col. P. A. Kenney, MC, U. S. A.*

The Person as a Nurse (Professional Adjustments), by *Florence C. Kempf*, R. N., A. M., Assistant Director of Nursing Service, University Hospitals of Cleveland, Ohio; formerly, Associate Director, Hartford Hospital School of Nursing; Assistant Director, Massachusetts General Hospital School of Nursing. 236 pages. The Macmillan Co., New York, N. Y., publishers, 1950. Price $3.25.

This book will enable the student nurse and the prenursing student to learn the requirements and the qualities necessary to one desirous of entering the nursing profession. The first two chapters are particularly good; the first gives the reader an excellent example of by whom and how students are selected for the school and the second describes the initial adjustments of the same students discussed in chapter one to the school. The point is made that in addition to good grades in nursing theory an adequate personality is necessary in order to live and work with many people in this profession. The text should also be of value to those interested in personnel work as it brings out some of the problems encountered in integrating varied personalities into a career that demands much self-adjustment to produce the best results. Miss Kempf has presented the material in a most interesting manner, which makes for enjoyable reading.—*Lt. Comdr. M. Terrill, NC, U. S. N.*

Modern Trends in Obstetrics and Gynaecology, edited by *Kenneth Bowes*, M. D., M. S. (Lond.), M. B., Ch. B. (Liverpool), F. R. C. S., Obstetric Physician, St. Thomas's Hospital; Surgeon, Grosvenor Hospital for Women, London; Consultant Gynaecologist, S. W. London Regional Metropolitan Board; Examiner to the Examining Board in England; Sometime Examiner, University of London. 778 pages; illustrated. Paul B. Hoeber, Inc., New York, N. Y., publishers, 1950. Price $12.

This book is a collection of monographs written by men who are considered authorities in their fields. The introduction outlines the purpose of the book by stating, "The wealth of anatomical, physiological, and other researches on fundamental problems of gynecology and obstetrics which has appeared during the last fifteen years makes it necessary for a book on lines of progress in these subjects to include chapters from contributors who are not engaged in clinical work in them," and, "An attempt has been made to bring together material from various fields, to indicate some subjects of immediate interest, and to mention the main trends in clinical obstetrics and gynecology."

Of the book's 54 chapters some are exceptionally well written and some are average, but none are poor. Some merit special comment. The first on the anatomy of the bony pelvis and pelvic floor is clearly written and well illustrated. This is followed by one on the vascular anatomy of the adult human uterus dealing with dynamic rather than static angiology. The latter is in a relatively new field. It is especially well written and should be read by all those who are interested in the physiology of the endometrium. The chapter on psychologic factors is brief but meaty and most readers will agree with its fundamental assertions. A very important and usually neglected subject is well handled in the chapter on the physiology of the placenta. The various phases of this physiology such as placental development; hemodynamics; the mechanism and dynamics of placental transfer or passage of crystalloids, colloids, immune proteins, organisms, water and so on are presented in clear concise language. This chapter includes a resume of the concept of the control of maternal metabolism by the placenta through its hormone elaboration.

"Aspects of Foetal Physiology" by Windle is a reprinting of his monograph "Asphyxia Neonatorium" (Charles C Thomas, Publisher, Springfield, Ill.). It is outstanding and should be studied in either book by all who treat the newborn. The chapter on the Rh factor in pregnancy by Mollison is the best article I have read on this complex and controversial subject. Macafee's chapter on

hemorrhage associated with pregnancy and childbirth is exceptionally good. He and Johnson are the leaders in the fight for the "conservative" management of antepartum hemorrhage, especially in placenta praevia. I believe theirs is the only acceptable management of this frightening complication. Such management has been shown to reduce maternal and infant mortality as well as the incidence of cesarean section.

In a chapter on heart disease and pregnancy, termination of pregnancy up to the sixteenth week in New York Academy Grade II b or III heart disease is advocated but after this period interruption involves too great a risk. I believe most American clinics would agree but would not usually interrupt pregnancy in Grade II b patients. Early interruption of pregnancy is also recommended in patients classified Grade III in a previous pregnancy. I believe that a patient in Grade III should be sterilized before she again becomes pregnant. I agree that cesarean section in late pregnancy in cardiac patients is undesirable. The chapter on tuberculosis and pregnancy states that therapeutic abortion is rarely either necessary or beneficial to patients with this disease. That on the operative treatment of genital prolapse by Shaw is masterfully written but unfortunately his new and effective operation for prolapse of the vaginal vault after hysterectomy is not described.

The bibliographies, at the end of each chapter, are complete in that most if not all important references are listed.

This book is well arranged, printed clearly on good paper, has good, but too few, illustrations and is excellently written.

—*Col. J. W. Simpson, MC, U. S. A.*

Comparative Animal Physiology, by *David W. Bishop*, Professor of Physiology, University of Massachusetts; *Frank A. Brown, Jr.*, Professor of Biology, Northwestern University; *Theodore L. Jahn*, Professor of Zoology, University of California at Los Angeles; *C. Ladd Prosser*, Professor of Physiology, University of Illinois; and *Verner J. Wulff*, Assistant Professor of Physiology, University of Illinois; edited by *C. Ladd Prosser*. 888 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publisher, 1950. Price $12.50.

This book is a further documentation of the zoologic maxim that ontogeny repeats phylogeny. The authors carry this thesis from a consideration of water utilization by protozoa to water balance among higher vertebrates, through the chief divisions of animal function to and including a consideration of primitive conduction of waves of excitation up to the most complex conditioning and learning among the higher animals. The work is thoroughly scholarly. Each chapter has an extensive but selective bibliography and a helpful conclusion or summary is found at least once in each chapter. The index is complete and well prepared. Those whose attention has been concentrated on mammalian physiology, will be surprised to find this book "comparative" in its wider sense. As much or more attention is given to lower phyla as to the *Class mammalia, Phylum vertebrata*. Examples are cited frequently by use of a single scientific name, e. g., Ornithorhynchus, Dyticus, Raja, et cetera, which are not found in medical dictionaries or standard English dictionaries. This makes comprehension more difficult for persons without recent experience in zoologic nomenclature. Although this volume will not be of immediate value to the clinicians, it points out generalizations of value to persons engaged in experimental medicine.—*Maj. R. O. Anslow, VC, U. S. A.*

Child Psychiatry in the Community, a Primer for Teachers, Nurses, and Others Who Care for Children, by *Harold A. Greenberg*, M. D., Senior Staff Psychiatrist, Institute for Juvenile Research, Chicago; Assistant Professor of Criminology, College of Medicine, University of Illinois, Chicago; in

collaboration with *Julian H. Pathman,* Ph. D., Chief Psychologist, Downey Veterans Administration Hospital, Downey, Ill.; formerly Assistant Professor of Psychiatry and Psychologist, Illinois Neuropsychiatric Institute, College of Medicine, University of Illinois, Chicago; formerly Senior Staff Psychologist, Institute for Juvenile Research, Chicago; *Helen A. Sutton,* R. N., B. A., B. S., formerly Psychiatric Nursing Instructor, Illinois Neuropsychiatric Institute, College of Medicine, University of Illinois; Chicago; and *Marjorie M. Browne,* B. A., M. A., Instructor, School of Social Service Administration, University of Chicago. 296 pages; illustrated. G. P. Putnam's Sons, New York, N. Y., publisher, 1950. Price $3.50.

The function and purpose of this volume is best described by the subtitle. The book has the limited, but valuable, objective of explaining operation of a child guidance clinic, in all its component parts, to those in any community who are interested in child welfare and who are in a position to refer patients in need of therapy. A short introductory section describes the psychogenesis of behavior disorders. The style is clear and the terminology is precise. No effort is made to teach therapy, but a step by step description of the operation of a clinic is given. There are chapters by a clinical psychologist, psychiatric nurse, and psychiatric social worker, respectively detailing their functions. The relationship of the entire team to the community is discussed in detail. Most of the material was collected at the famed Institute for Juvenile Research in Chicago, with some comparisons with other child guidance organizations. The appendix includes a short glossary and bibliography that should be helpful to the reader for whom the book is designed. It well fulfills its intended function.—*Commander F. H. Ocko, MC, U. S. N.*

Introduction to the Regulation of Blood Pressure and Heart Rate, by *Corneille Heymans,* M. D., Professor of Pharmacology, University of Ghent (Belgium). Publication Number 43, American Lecture Series. 60 pages; illustrated. Charles C Thomas, Springfield, Ill., publisher, 1950. Price $2.

This brief introduction to the subjects presented touches on the many factors involved in the physiologic processes concerned. A medical student might feel rewarded after glancing through this presentation prior to a final examination in physiology as such a review might recall details of the more elaborate concept of such physiologic processes. A practitioner out of contact with scientific thought might be able to refresh dormant recollections of physiologic principles by such reading. Most of the bibliographic references are not in English and less than one-third cite American literature. As an example it may be noted that, although his name is mentioned once in the text, no bibliographic reference is made to the many contributions in the past 40 years, of Carl J. Wiggers to the understanding of the physiology of the circulatory system.

—*Col. R. L. Cox, MC, U. S. A.*

Problems in Cerebellar Physiology, by *G. Moruzzi,* M. D., Professor and Head of the Department of Physiology, University of Pisa, Pisa, Italy; Annual Research Professor of Neurology, Northwestern University Medical School, Chicago, Ill. 116 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $3.25.

This small monograph by an authority on neurophysiology presents a critical and lucid review of recent advances made in physiologic studies of the cerebellum, and it gives one a clear concept of the critical approach which is so necessary in analyzing the experimental facts available and in forming the hypotheses for future research. It outlines the recently acquired knowledge of the physiology of the anterior lobe of the cerebellum. The author discusses the cerebellar inhibition and facilitation of postural tonus, the functional interrelations between the cerebellum and the cerebral motor cortex, and the

influence of the cerebellum on certain autonomic functions. The title is well chosen—the newer electrophysiologic methods have accentuated some of the older problems as they solved others, and they have also uncovered new and broader problems. There is a short but adequate index and a bibliography of 85 references.—*Lt. Comdr. R. G. Berry, MC, U. S. N.*

Visual Anatomy: Head and Neck, by *Sydney M. Friedman*, M. D., Ph. D., Professor of Anatomy, University of British Columbia, Vancouver, Canada; Formerly, Associate Professor of Anatomy, McGill University, Montreal, Canada. 217 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $6.50.

Any attempt to facilitate the learning of anatomy or to prolong its retention after learning has always been welcome. For that reason this book should have a particular appeal to a large group of medical practitioners and students. The author presents the anatomy of the head and neck in such a way that it can easily be remembered, reconstructing it from within outward, much in the same manner as a sculptor or medical illustrator might. This book was not meant to supplant standard anatomy texts, but rather to supplement them. The fact that each diagram is supplied with a facing page of text decreases the amount of page turning, and makes the study of the diagrams easy and pleasant. The manner in which the various planes and muscle layers of the submandibular region are presented admirably clarifies the relationships of structures in that area. The author has interspersed this text abundantly with clinical applications of the anatomy in the area under discussion. There is but one criticism to be made of this excellent volume. The author could have enhanced the ease of recognition and the permanance of retention of many of his illustrations if he had extended his practice, applied in a few figures, of using red and blue to indicate arteries and veins.—*Lt. Comdr. M. Schiff, MC, U. S. N.*

Methods in Medicine, The Manual of the Medical Service of George Dock, M. D., Sc. D., Formerly Professor of Medicine, Washington University School of Medicine; Formerly Physician-in-Chief, Robert A. Barnes Hospital, St. Louis. A Comprehensive Outline for Clinical Investigation, Management, and Treatment of Patients with Various Medical Disorders by *George R. Herrmann*, M. D., Ph. D., Professor of Medicine, University of Texas Medical Branch at Galveston; Director of the Cardiovascular Service and Heart Station, University of Texas Hospitals; Consultant in Medicine to the Surgeon General, U. S. Army; Consultant in Vascular Diseases to the Marine Hospital, U. S. P. H. S. 2d edition, completely revised. 488 pages. The C. V. Mosby Co., St. Louis, Mo., publisher, 1950. Price $7.50.

This book discusses briefly the material that should be included in a medical history and physical examination. There are clear and concise instructions for performing most of the common laboratory tests. Simple procedures such as the red blood cell count, routine urinalysis, measurement of vital capacity; and determination of circulation time are included as well as a method for the determination of serum potassium. The fact that there are no illustrations in the book reduces its cost but makes it of less value. The book would be useful to the student during his clinical clerkship and to the intern who may have to perfomn many of these tests. Any of the standard texts on laboratory methods would serve equally well. The chapter on dietetic methods is excellent. Peptic ulcer, low sodium, low cholesterol, and diabetic diets are discussed in sufficient detail for the average internist. The book would not be of much value to the experienced internist.—*Col. M. C. Davidson, MC, U. S. A.*

Encyclopedia of the Eye, Diagnosis and Treatment, by *Conrad Berens*, M. D., F. A. C. S., Executive Eye Surgeon, New York Eye and Ear Infirmary; Professor of Clinical Ophthalmology, Post-Graduate Medical School, New York University; President, Pan-American Association of Ophthalmology, Managing Director of the Ophthalmological Foundation, Inc., President, Snyder Ophthalmic Foundation; and *Edward Siegel*, M. A., M. D., Attending Ophthalmologist, Champlain Valley Hospital, Plattsburg, N. Y.; Associate Attending Ophthalmologist, Physicians Hospital, Plattsburg. 272 pages. 76 illustrations including 42 subjects in color. J. B. Lippincott Co., Philadelphia, Pa., publisher, 1950. Price $5.

This text, using the encyclopedic form, provides a quick reference for the diagnosis and treatment of the more common ophthalmologic conditions. For this reason its greatest value will be to the busy general practitioners, pediatricians, and medical students. Ophthalmologists and others may also benefit from it. The title refers more to the form than to the comprehensiveness of its contents. The authors note this in the preface and state that "the term 'encyclopedia' is used with 'apology' for many terms and much of the detail that ordinarily would be used in such a volume has been omitted. The common problems that the physician encounters are stressed." The sections on pediatric ophthalmology and therapeutics are particularly praiseworthy. Where surgery is indicated, the name of the operation is mentioned, but details are lacking as beyond the scope of the text. The illustrations are good but are grouped together in about the center of the book rather than adjacent to the context. The information in this book is condensed, readable, and practical. It is well indexed.—*Col. A. A. Albright, MC, U. S. A.*

The 1950 Year Book of General Surgery (July 1949–June 1950), edited by *Evarts A. Graham*, A. B., M. D., Professor of Surgery, Washington University School of Medicine; Surgeon-in-Chief of the Barnes Hospital and of the Children's Hospital, St. Louis; with a section on Anesthesia edited by *Stuart C. Cullen*, M. D., Professor of Surgery and Chairman of Division of Anesthesiology, State University of Iowa College of Medicine and Hospitals. 670 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1950. Price $5.

This volume has extracted much that is good from the surgical literature of the period covered. The abstracts contain the gist of the article abstracted but necessarily lose much of interest in the process of condensation. A highly concentrated summary of many subjects presents the reader with too much in too short a space to allow proper absorption and digestion. By the use of the Year Book, however, one may cull subjects of particular interest from which complete reference may later be obtained. The introduction prepared by Dr. Graham for this volume highlights the surgical advances of the past decade. Progress in anesthesia and thoracic surgery during this period is indeed impressive. Review of the essays presented in the volume reveals much collation of statistics and development in technic, but little advance in the fundamentals of surgery seems to have been accomplished in 1950.

—*Lt. Col. F. D. Threadgill, MC, U. S. A.*

Neurology and Psychiatry in General Practice, edited by *Henry R. Viets*, M. D., in collaboration with *C. Charles Burlingame*, M. D., *Clarence B. Farrar*, M. D., and *Z. M. Lebensohn*, M. D. 150 pages. Grune & Stratton, Inc., New York, N. Y., publisher, 1950. Price $3.50.

For practitioners who have little free time to follow advances in neurology and psychiatry, this book offers a "simplified, frank, and eclectic" sampling of outstanding problems which may be encountered in daily practice. Sufficient information is presented usually in a clear and concise manner to orient the

physician toward the proper understanding and generally accepted treatment of the physical and emotional illnesses discussed. Because it is not intended to be a textbook, neither a suitable bibliography nor references have been made available. This is regrettable for it does not allow the physician to amplify his knowledge if he so desires.

The neurologic section is better written than the psychiatric section. The importance of recognizing the effect of emotional factors in all the discussions of organic neurologic disease is emphasized. Epilepsy, Parkinsonism, and neurosyphilis are skillfully discussed. The discussion of migraine and other headaches, with their multiple psychologic and organic ramifications is so condensed that prior to using each therapeutic procedure outlined, the physician should be well aware of the total personality make-up and emotional factors that may also influence the patient's response to therapy.

In the psychiatric section, much valuable information and many useful principles are offered. The discussions of the alcoholic patient, the management of anxiety, and electro-convulsive therapy are excellent. Psychosomatic medicine and psychotherapy are superficially described. In some instances, statements are made which appear to misrepresent the facts. For example, in the discussion "Referring the Patient," the "pure" psychoanalyst is compared to the psychiatrist as though the psychoanalyst often disregards many psychiatric procedures of well established value. A competent, well-trained medical psychoanalyst is primarily a well-trained psychiatrist who would naturally consider all factors involved in the proper treatment of patients and one who used full-scale psychoanalysis only in those cases which meet certain basic requirements for such therapy. The medical psychoanalyst constantly makes use of dynamic psychology and analytic understanding in his approach to all patients as Knight (*1*) has so aptly observed. In principle, a competent therapist will evaluate the patient and select from available psychotherapeutic approaches and technics, those which, in his best clinical judgment, are most appropriate in any given case. He will either use them if they are part of his own armamentarium or refer the patient to the proper therapist whether it is for full scale analysis or for electroshock therapy or other special therapies.

This publication will serve its purpose well in making neurologic and psychiatric subjects simple and interesting to general practitioners and should stimulate them to increased activity in these fields.

—*Lt. Col. L. E. Gatto, U. S. A. F. (MC)*

The Dispensatory of the United States of America, by *Arthur Osol,* Ph. G., M. S., Ph. D., Professor of Chemistry and Director of the Department of Chemistry, Philadelphia College of Pharmacy and Science; Member of the Committee of Revision of the United States Pharmacopoeia, and *George E. Farrar, Jr.,* M. D., F. A. C. P., Associate Professor of Medicine, School of Medicine, Temple University; Member of the Committee of Revision of the United States Pharmacopoeia; With *E. Emerson Leuallen,* M. Sc., D. Sc., Professor of Pharmacy and Chairman of the Department of Pharmacy, Columbia University College of Pharmacy; Pharmacy Editor, American Druggist; *Heber W. Youngken,* Ph. M., Ph. D., Sc. D., Professor of Pharmacognosy and Biology, Massachusetts College of Pharmacy; Member of the Committee of Revision of the United States Pharmacopoeia; *Willard F. Verwey,* Sc. D., Director of Bacteriological Research, Medical Research Division, Sharp and Dohme, Inc.; and *David K. Detweiler,* V. M. D., M. S., Assistant Professor of Pharmacology, School of Veterinary Medicine, University of Pennsylvania. Advisory Editor, *Horatio C. Wood, Jr.,* M. D., Ph. M.,

(*1*) "A Critique of the Present Status of the Psychotherapies," by Robert P. Knight, M. D., published in the Bulletin of the New York Academy of Medicine, February 1949.

Professor of Pharmacology, Philadelphia College of Pharmacy and Science. Complete in two volumes; Volume 1: Based on the Thirteenth Revision of The United States Pharmacopoeia, The National Formulary, Eighth Edition, and The British Pharmacopoeia, 1932, and its Addenda. Volume 2 (bound with Volume 1): Being a commentary on the new drugs introduced in the Fourteenth Revision of The United States Pharmacopeia, The National Formulary, Ninth Edition, The British Pharmacopoeia, 1948, as well as the new drugs not officially recognized. 24th edition. 2,057 pages. J. B. Lippincott Co., Philadelphia, Pa., publisher, 1950. Price $25.

The United States Dispensatory, Volume I, 24th Edition, published in 1947, is based on the Thirteenth Revision of the United States Pharmacopoeia, the National Formulary, Eighth Edition, and the British Pharmacopoeia, 1932, and its seven addenda. Every drug and preparation of these legal standards, including all of the new antibiotics, hormones, antihistaminics, et cetera, is covered in detail. Descriptive articles on practically all substances important to the professions of pharmacy and medicine, but not included in the three legal standards, are also presented; the substances recognized in New and Nonofficial Remedies are especially designated.

Volume II of the 24th Edition, published in 1950, and bound with Volume I includes the *new* drugs of the Fourteenth Revision of the United States Pharmacopeia, the National Formulary, Ninth Edition, the British Pharmacopoeia, 1948, and 88 new drugs not officially recognized. Cortisone, ACTH, folic acid antagonists, terramycin, mephenesin, hexachlorophene, and other new items only recently reported in the current literature are described. The primary purpose of each edition of the Dispensatory is to provide information about new drugs and current information about drugs already in use. An entirely new section dealing with the uses and doses of drugs employed in veterinary medicine has been added in the new edition which also includes data on general tests, processes, reagents, and solutions, as well as various tables that are not found in the Pharmacopeia or National Formulary.

The first edition of the Dispensatory appeared about 115 years ago. In the past it was probably used more by the pharmacist than the physician, but today it contains so much information on both medical and pharmaceutical matters, not readily available elsewhere, that this reference is of daily value to the pharmacist, physician, laboratory worker, and teacher. Complete and authoritative individual monographs are arranged alphabetically according to the English title. Each provides full coverage of the subject, including Latin titles, abbreviations, official definitions, official and nonofficial synonyms, and foreign language titles. Various trade names and trade-marks with details of the manufacturing process and history are presented. These monographs give official descriptions, including tests, assay methods, constituents, and adulterants. A portion of each monograph is devoted to a discussion of therapeutic uses and dosage. Many significant details of usage are included and special emphasis is placed on the toxicology of the drug and precautions to be observed during its administration. The format is convenient and agreeable and the book has been carefully indexed.

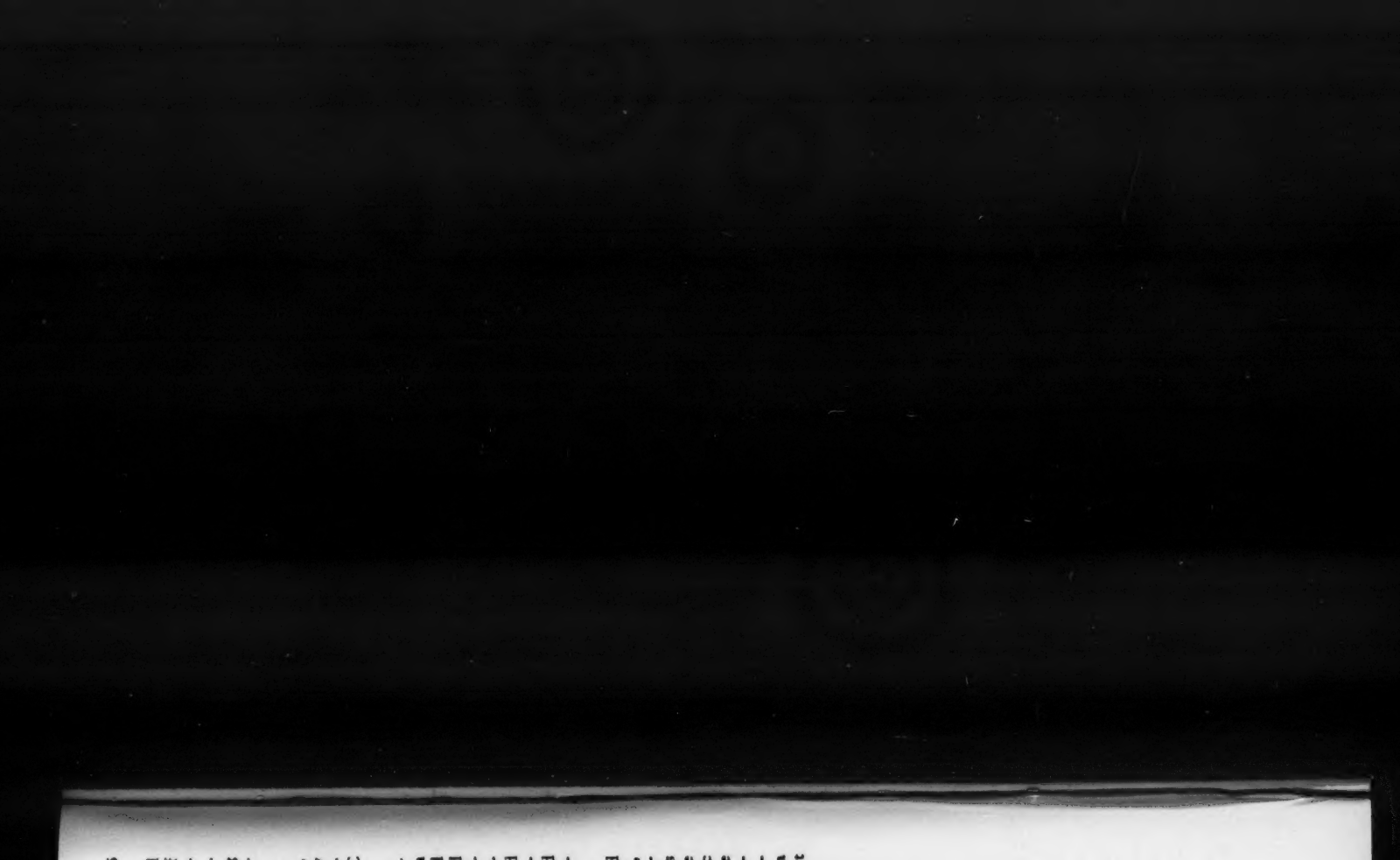
—*Commander W. P. Briggs, MSC, U. S. N.*

The Preparation of Photographic Prints For Medical Publication, by *Stanley J. McComb,* F. B. P. A., Section on Photography, Mayo Clinic, Rochester, Minn. 65 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $2.

The novice or inexperienced photographer will gain from this book an appreciation of the value of good illustrations in the presentation of technical and scientific subject matter for medical publications. Some of the frequently en-

countered problems are described in a concise manner and easily accomplished corrective procedures are presented. The author has adhered to standards of "maximal definition and clarity of detail." The information is grouped to include such factors as sharpness of focus, scale-size and position, backgrounds, lighting, emphasis (single point of interest), film and filters, printing and print quality, technics for improving print quality, and trimming and grouping of prints.—*E. M. Gunn, M. D.*

Fainting, Physiological and Psychological Considerations, by *George L. Engel*, M. D., Associate Professor of Medicine and Psychiatry, The University of Rochester School of Medicine and Dentistry, Rochester, N. Y. Publication Number 37, American Lecture Series. 141 pages. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $2.75.

In this monograph, the author attempts to explain the mechanisms and clinical characteristics of the various types of fainting in the light of modern physiologic and psychologic knowledge. In large part it is a summary and elaboration of original studies and experiments carried out by the author and his coworkers. Syncope, as defined here, is not limited to the state of unconsciousness but includes such premonitory symptoms as giddiness, faintness, and weakness. With this definition in mind, syncope has been grouped into different types according to underlying, common mechanisms. Thus syncope may be caused by: (1) fall in arterial blood pressure, (2) cardiac stand still, (3) cerebral vascular disorders, (4) cerebral metabolic disorders, (5) hysteria, (6) hyperventilation, and (7) heart disease.

Succeeding chapters deal with the symptoms, signs, etiologic factors, and treatment in connection with each of these causes. According to the authors, vasodepressor syncope is probably the most common form of fainting and represents a reaction which occurs during the experiencing of fear when action is inhibited or impossible. Thus the psychologic factor is of major import in the genesis of this particular form of fainting. To a greater or lesser extent psychic influences are concerned in the causation of the other types of syncope. The outstanding attribute of the monograph is the simplicity and clarity of expression and the absence of technical graphs and involved statistical data. Consequently it should be of great practical benefit to the practicing physician as a diagnostic aid. The only criticism that might be offered is that treatment technics are too briefly described.—*Lt. Col. D. S. Evans, U. S. A. F. (MC)*